US Army Corps
of Engineers®
Walla Walla District

DRAFT

Lower Snake River Juvenile Salmon Migration Feasibility Report/ Environmental Impact Statement

APPENDIX N
Cultural Resources

December 1999

FEASIBILITY STUDY DOCUMENTATION

Document Title	
Summary to the Lower Snake River Juvenile Salmon Migration Feasibility Report/Environmental Impact Statement	
Lower Snake River Juvenile Salmon Migration Feasibility Report/Environmental Impact Statement	
Appendix A	Anadromous Fish
Appendix B	Resident Fish
Appendix C	Water Quality
Appendix D	Natural River Drawdown Engineering
Appendix E	Existing Systems and Major System Improvements Engineering
Appendix F	Hydrology/Hydraulics and Sedimentation
Appendix G	Hydroregulations
Appendix H	Fluvial Geomorphology
Appendix I	Economics
Appendix J	Plan Formulation and Decision Analysis Model
Appendix K	Real Estate
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Appendix M	Fish and Wildlife Coordination Act Report
Appendix N	Cultural Resources
Appendix O	Public Outreach Program
Appendix P	Air Quality
Appendix Q	Tribal Consultation/Coordination
Appendix R	Historical Perspectives
Appendix S	Snake River Maps
Appendix T	Biological Assessment
Appendix U	Clean Water Act, Section 404(b)(1) Evaluation

The documents listed above, as well as supporting technical reports and other study information, are available on our website at www.nww.usace.army.mil. Copies of these documents are also available for public review at various city, county, and regional libraries.

FOREWORD

This appendix is one part of the overall effort of the U.S. Army Corps of Engineers (Corps) to prepare the Lower Snake River Juvenile Salmon Migration Feasibility Report/Environmental Impact Statement (FR/EIS).

Please note that this document is a DRAFT appendix and is subject to change and/or revision based on information received through comments, hearings, workshops, etc. After the comment period ends and hearings conclude a Final FR/EIS with Appendices is planned.

The Corps has reached out to regional stakeholders (Federal agencies, tribes, states, local governmental entities, organizations, and individuals) during the development of the FR/EIS and appendices. This effort resulted in many of these regional stakeholders providing input, comments, and even drafting work products or portions of these documents. This regional input provided the Corps with an insight and perspective not found in previous processes. A great deal of this information was subsequently included in the Draft FR/EIS and Appendices, therefore, not all the opinions and/or findings herein may reflect the official policy or position of the Corps.

STUDY OVERVIEW

Purpose and Need

Between 1991 and 1997, due to declines in abundance, the National Marine Fisheries Service (NMFS) made the following listings of Snake River salmon or steelhead under the Endangered Species Act (ESA) as amended:

- sockeye salmon (listed as endangered in 1991)
- spring/summer chinook salmon (listed as threatened in 1992)
- fall chinook salmon (listed as threatened in 1992)
- steelhead (listed as threatened in 1997)

In 1995, NMFS issued a Biological Opinion on operations of the Federal Columbia River Power System. The Biological Opinion established measures to halt and reverse the declines of these listed species. This created the need to evaluate the feasibility, design, and engineering work for these measures.

The U.S. Army Corps of Engineers (Corps) implemented a study after NMFS's Biological Opinion in 1995 of alternatives associated with lower Snake River dams and reservoirs. This study was named the Lower Snake River Juvenile Salmon Migration Feasibility Study (Feasibility Study). The specific purpose and need of the Feasibility Study is to evaluate and screen structural alternatives that may increase survival of juvenile anadromous fish through the Lower Snake River Project (which includes the four lowermost dams operated by the Corps on the Snake River—Ice Harbor, Lower Monumental, Little Goose, and Lower Granite dams) and assist in their recovery.

Development of Alternatives

The Corps completed an interim report on the Feasibility Study in December 1996. The report evaluated the feasibility of drawdown to natural river levels, spillway crest, and other improvements to existing fish passage facilities. Based in part on a screening of actions conducted in the interim report, the study now focuses on four courses of action:

- Existing conditions (currently planned fish programs)
- System improvements with maximum collection and transport of juveniles (without major system improvements such as surface bypass collectors)
- System improvements with maximum collection and transport of juveniles (with major system improvements such as surface bypass collectors)
- Dam breaching or permanent drawdown to natural river levels for all reservoirs

The results of these evaluations are presented in the combined Feasibility Report (FR) and Environmental Impact Statement (EIS). The FR/EIS provides the support for recommendations that will be made regarding decisions on future actions on the Lower Snake River Project for passage of juvenile salmonids. This appendix is a part of the FR/EIS.

Geographic Scope

The geographic area covered by the FR/EIS generally encompasses the 140-mile long lower Snake River reach between Lewiston, Idaho and the Tri-Cities in Washington. The study area does slightly vary by resource area in the FR/EIS because the affected resources have widely varying spatial characteristics throughout the lower Snake River system. For example, socioeconomic effects of a permanent drawdown could be felt throughout the whole Columbia River Basin region with the most effects taking place in the counties of southwest Washington. In contrast, effects on vegetation along the reservoirs would be confined to much smaller areas.

Identification of Alternatives

Since 1995, numerous alternatives have been identified and evaluated. Over time, the alternatives have been assigned numbers and letters that serve as unique identifiers. However, different study groups have sometimes used slightly different numbering or lettering schemes and this has lead to some confusion when viewing all the work products prepared during this long period. The primary alternatives that are carried forward in the FR/EIS currently involve four major alternatives that were derived out of three major pathways. The four alternatives are:

Alternative Name	PATH[1/] Number	Corps Number	FR/EIS Number
Existing Conditions	A-1	A-1	1
Maximum Transport of Juvenile Salmon	A-2	A-2a	2
Major System Improvements	A-2’	A-2c	3
Dam Breaching	A-3	A-3a	4

[1/] Plan for Analyzing and Testing Hypotheses

Summary of Alternatives

The **Existing Conditions Alternative** consists of continuing the fish passage facilities and project operations that were in place or under development at the time this Feasibility Study was initiated. The existing programs and plans underway would continue. Project operations, including all ancillary facilities such as fish hatcheries and Habitat Management Units (HMUs) under the Lower Snake River Fish and Wildlife Compensation Plan (Comp Plan), recreation facilities, power generation, navigation, and irrigation would remain the same unless modified through future actions. Adult and juvenile fish passage facilities would continue to operate.

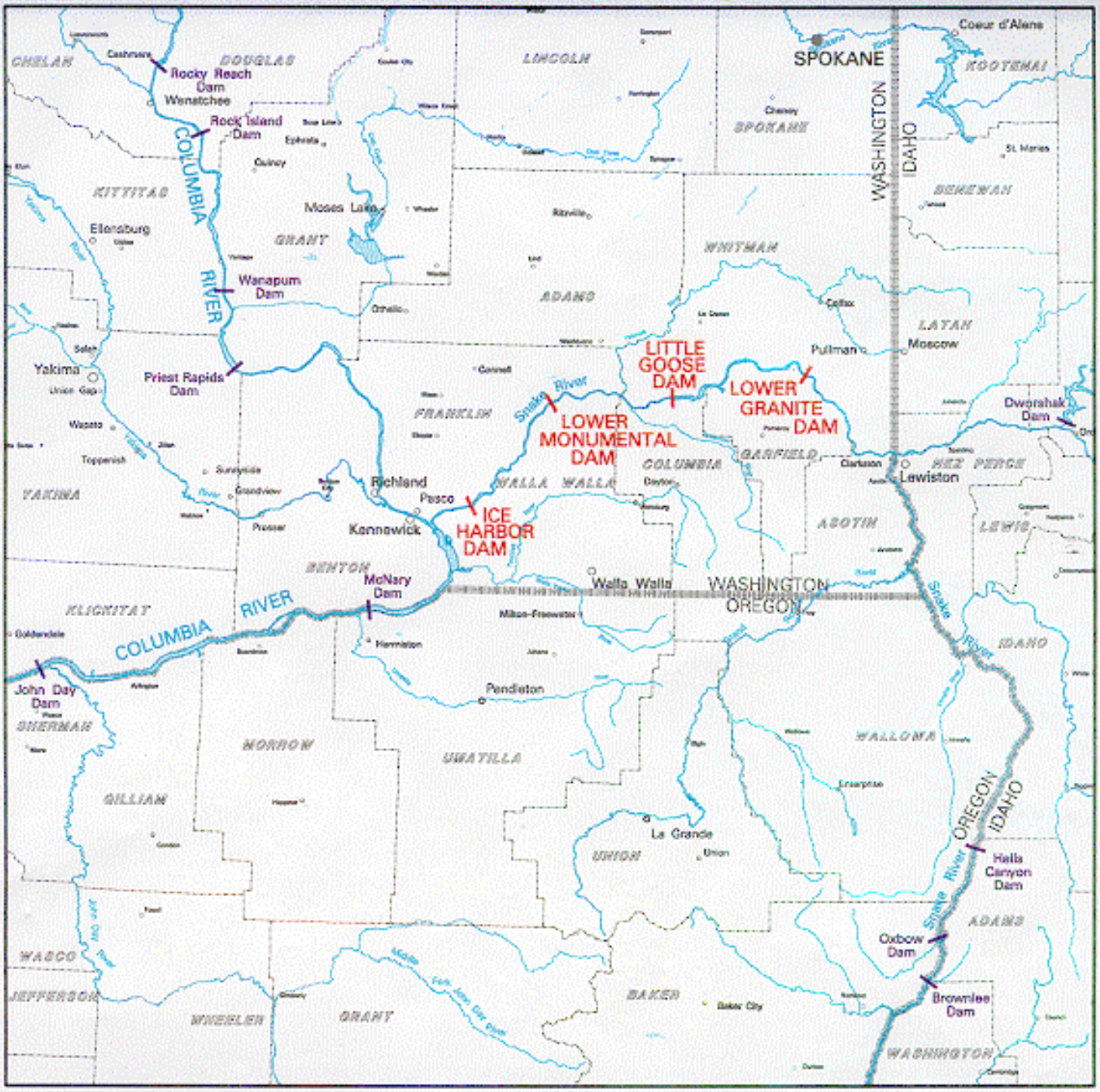
The **Maximum Transport of Juvenile Salmon Alternative** would include all of the existing or planned structural and operational configurations from the Existing Conditions Alternative. However, this alternative assumes that the juvenile fishway systems would be operated to maximize fish transport from Lower Granite, Little Goose, and Lower Monumental and that voluntary spill would not be used to bypass fish through the spillways (except at Ice Harbor). To accommodate this maximization of transport some measures would be taken to upgrade and improve fish handling facilities.

The **Major System Improvements Alternative** would provide additional improvements to what is considered under the Existing Conditions Alternative. These improvements would be focused on using surface bypass collection (SBC) facilities in conjunction with extended submersible bar screens (ESBS) and a behavioral guidance system (BGS). The intent of these facilities is to provide more effective diversion of juvenile fish away from the turbines. Under this alternative the number of fish collected and delivered to upgraded transportation facilities would be maximized at Lower Granite, the most upstream dam, where up to 90 percent of the fish would be collected and transported.

The **Dam Breaching Alternative** has been referred to as the "Drawdown Alternative" in many of the study groups since late 1996 and the resulting FR/EIS reports. These two terms essentially refer to the same set of actions. Because the term drawdown can refer to many types of drawdown, the term dam breaching was created to describe the action behind the alternative. The Dam Breaching Alternative would involve significant structural modifications at the four lower Snake River dams allowing the reservoirs to be drained and resulting in a free-flowing river that would remain unimpounded. Dam breaching would involve removing the earthen embankment sections of the four dams and then developing a channel around the powerhouses, spillways, and navigation locks. With dam breaching, the navigation locks would no longer be operational, and navigation for large commercial vessels would be eliminated. Some recreation facilities would close while others would be modified and new facilities could be built in the future. The operation and maintenance of fish hatcheries and Habitat Management Units (HMUs) would also change although the extent of change would probably be small and is not known at this time. Project development, design, and construction span a period of nine years. The first three to four years concentrate on the engineering and design processes. The embankments of the four dams are breached during two construction seasons at year 4-5 in the process. Construction work dealing with mitigation and restoration of various facilities adjacent to the reservoirs follows dam breaching for three to four years.

Authority

The four Corps dams of the lower Snake River were constructed and are operated and maintained under laws that may be grouped into three categories: 1) laws initially authorizing construction of the project, 2) laws specific to the project passed subsequent to construction, and 3) laws that generally apply to all Corps reservoirs.



BOUNDARIES

State

County

KM 300 100 0 MILES 7.5 15 30

125,000 ACRES

1 : 1,900,800

DRAFT

Lower Snake River

Juvenile Salmon Migration Feasibility Study

REGIONAL BASE MAP

1999

GIS Analysis & Graphic Assembly: Applied Technology Team (CENWW-PM-PD-E-AT)
GIS Applications Coordinator: Blaise Grden (CENWW-PM-PD-E-AT)
Study Manager: Blaise Grden (CENWW-PM-PD-E-AT)

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ABSTRACT

The Cultural Resources Appendix was prepared by the Walla Walla District Corps of Engineers and provides the primary source of information concerning the Feasibility Study potential to affect cultural resources. The appendix provides an understanding of what are cultural resources and the responsibilities the U.S. Army Corps of Engineers has toward their management. A discussion is provided to explain the predicted effects between the proposed alternatives to cultural resources.

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Lower Snake River Juvenile Salmon Migration Feasibility Report/ Environmental Impact Statement

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Appendix N
Cultural Resources

Produced by
U.S. Army Corps of Engineers
Walla Walla District

Completed November 1999
Revised and released for review
with Draft FR/EIS
December 1999

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FIGURES

ACRONYMS AND ABBREVIATIONS

AIRFA	American Indian Religious Freedom Act
BP	before present
CFR	Code of Federal Regulations
Corps	U.S. Army Corps of Engineers
CRM	Cultural Resource Management
NEPA	Natural Environmental Policy Act
NHPA	National Historic Preservation Act of 1966
NRHP	National Register of Historic Places

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Executive Summary

The Cultural Resources Appendix of the Lower Snake River Juvenile Salmon Migration Feasibility Study addresses effects to cultural resources that may be caused by the proposals under consideration.

The Corps manages lands in the lower Snake River that lie within the southern Columbia Plateau Culture Area. This is a distinct region with a rich archaeological past and a part of a culturally significant present for both Native and Euro-Americans. Archaeological data indicate that people have been living in the region for at least 11,000 years. Much human activity has taken place along the river in areas now managed by the Corps and where proposed management actions are being considered in the current feasibility Study.

Federal agencies are required by Federal law to preserve, protect, and manage cultural resources such as archaeological sites, historical sites, sacred sites, and traditional cultural properties. In order to meet this responsibility the Corps is studying the nature of the cultural resources which may be impacted by the project alternatives and how the impacts can be avoided, minimized, or mitigated. Since impacts to cultural resources will be only moderately changed by most of the proposed alternatives, this appendix focuses on those pathway alternatives which include extensive reservoir drawdowns. Such alternatives would significantly change the nature of cultural resources impacts and the necessary management actions.

Reservoir drawdowns would expose cultural sites that have been under water for many years. Vegetation, soil cover, soil stability, and other factors will have changed greatly at the re-exposed sites because of long-term inundation. Increased access to the re-exposed sites and future potential uses of the land would also have to be considered. Given that only a few comprehensive inventories have ever been conducted for reservoir lands, even for those currently accessible, fundamental unknowns exist that limit an analysis of how cultural resources would respond to either continued decades of inundation or the effects of re-exposure. The uncertainties for cultural resources, i.e., exact circumstances of their locations and conditions and what reasonable remedies are actually available to address adverse impacts to them, are impediments to any quantifiable assessments of cultural resources effects under proposed drawdown alternatives. However, monitoring of accessible resources and studies of inundated archaeological sites found under analogous conditions elsewhere suggest continued inundation of cultural resources is less preferable than effects resulting from reservoir drawdowns (Center for Northwest Anthropology, 1992). Direct access and management treatments for all Corps cultural resources are considered likely benefits that would generally reduce losses in cultural resources' integrity and more fully enable the Corps to consider them under existing Federal laws.

Cultural resources program objectives will be to meet current Federal laws and agency policies under whatever alternative is chosen for the Final EIS and Record of Decision. This includes consultation and collaboratively involving affected Indian tribes and traditional communities in Corps cultural resources planning and management activities. Concerns and remedies for cultural resources emerging from changed environmental conditions will be addressed through a host of program strategies including the following: Cultural Resources education/interpretation, enforcement of Federal cultural resources protection laws, comprehensive resource inventories, monitoring activities, site evaluations and nominations to the National Register of Historic Places,

and mitigation approaches such as data recovery to help preserve significant historic property values.

Under a reservoir drawdown scenario, many of the above management strategies must be rapidly implemented in order to limit adverse impacts to lower Snake River cultural resources. Systematic site evaluations must follow site exposures to determine the effects of years of inundation and appropriate treatments for groups of sites in order to protect or salvage the cultural and scientific values. Cultural resources management program actions necessarily would be a part of an ongoing process that would continue years after the implementation of a Feasibility Study alternative.

1. Introduction

In order to increase anadromous fish survival, this study is considering alternative actions, some of which would greatly change the management of the lower Snake River facilities. Cultural resources along the river would be affected by the proposed study. Federal agencies must comply with numerous laws, regulations, policies, and directives while considering change in water or land management. The Walla Walla District, U.S. Army Corps of Engineers (Corps) is the Federal agency responsible for the preservation and management of cultural resources within the Lower Snake River Project.

Much of this appendix has been taken from earlier cultural resources management documents produced by Federal agencies in the Columbia River Basin. This includes such resources as *An Overview of Cultural Resources in the Snake River Basin* by Kenneth C. Reid and others, *The Walla Walla District Cultural Resources Management Plan,* and the *Columbia River System Operation Review Final Environmental Impact Statement Cultural Resources Appendix*, as well as other documents. Although much information appearing here was penned in support of other undertakings, the nature of cultural resource management in the region is such that text presented here from earlier sources is considered valid for the present study.

Feasibility study alternatives related to cultural resources are summarized as follows:

1. Under the Existing Operation Alternative, for concerns pertaining to cultural resources, the hydropower facilities would continue to operate as originally designed.

2. Under the System Improvement Alternatives, maximum fish transportation either with or without system improvements would be stressed.

   These first alternatives impact cultural resources in essentially the same ways. For the most part, geomorphic processes have reached a near-equilibrium under operations since the impoundment of the reservoirs. Pool adjustments to optimize hydropower production, commercial navigation, irrigation, and recreation have caused impacts.

   Ongoing erosion has stabilized to some extent on the reservoirs. Some of this effect is due to bank stabilization structures in placed at various locations to slow or halt erosion.

3. Under the Reservoir Drawdown Alternatives, the lower Snake River would be free-flowing from Hells Canyon Dam to the Ice Harbor Dam area, with some seasonal flow augmentation intended to support anadromous fish runs. This would expose sites that have been inundated for up to 37 years. Some existing bank stabilization measures could be made superfluous by the free-flowing river alternative. Many, however, would still provide a level of protection from impacts other than those for which they were originally designed.

1.1 Purposes and Objectives

As a part of the Corps' compliance requirements under Sections 106 and 110 of the National Historic Preservation Act of 1966 (NHPA), this document provides an assessment of the cultural resources environment as now understood with regard to the current study. Proposed actions under this study would impact cultural and historic properties in a number of potential ways. Those

impacts must be understood, provided for, and mitigated to the extend practicable for each of the alternative pathways.

1.2 Cultural Resources Defined

Cultural resources in the Snake River Basin consist of artifacts, sites, and districts (groups of closely associated sites). Together these resources represent the full range of prehistory and history (over 11,000 years of human presence) by indigenous cultures, and an historic American settlement in the lower Snake River. Cultural resources of the types found in the Snake River project are described in Federal law as either archaeological sites (historic properties as defined in the National Historic Preservation Act, Title III, Sec. 301), artifacts of potential significance, and traditional cultural properties. Typically, traditional cultural properties require the involvement of traditional American Indian communities/tribes in order to be identified and documented. Cultural resources also include the remains of historic settlement and development activities of Euro-Americans, Asians, and other non-Native cultural activities over the past 200 years.

Prehistoric period archaeological sites are typically represented by open campsites, housepit villages, rock shelters, rock art (petroglyphs/pictographs), lithic quarries and workshops, burials and cemeteries; and isolated rock cairns, pits, and alignments. Historical sites are denoted by structures, buildings, objects that represent post-contact human activity. These include the remains of farms, towns, trading posts, mining sites, military forts, burial sites, abandoned settlements, and transportation and industrial facilities. These features are identified and evaluated on the basis of tangible traces, materials, or scientific evidence of significant cultural activity.

Contemporary Native Americans recognize archaeological sites, but also emphasize their interests in traditional cultural properties. Traditional cultural properties, as a class of cultural resources, may include a broad range of features from the natural environment and the sacred world. For example, certain distinctive shapes in the natural landscape, features in a tribe's cultural geography, habitats for culturally significant food and medicinal plants, traditional fisheries, sacred religious sites and places of spiritual renewal may comprise traditional cultural properties. Some tribes assert that the Snake River itself is a traditional cultural property. Traditional cultural properties are places and resources comprised of both cultural sites and natural elements significant in contemporary traditional social and religious practices, which often help preserve traditional cultural identities of an ethnic group.

The cultural resources of the lower Snake River are a rich source of information about past human activity and are directly subject to impacts by the water resources developments. The record of human activity in the Snake River Basin, as revealed in archaeological and historical studies, may stretch back 13,000 years and possess valuable information about the environment and human adaptation to it over time. As the cultural resources of the region become more fully known through systematic investigation and analysis, our understanding of native peoples' past life ways is made more clear for both public and scientific interests.

1.2.1 Criteria of Significance

The question is often posed; Are all old things equally important? How are heritage resources assessed for their significance? Historic property significance is a legal standard discovered through the site evaluation process as defined in 36 Code of Federal Regulations (CFR) Part 60 (NHPA). This is the process used to determine the eligibility status of historic properties for listing

on the National Register of Historic Places (NRHP); it involves the identification, evaluation and management of cultural resources. In 36 CFR Part 60.4 (criteria for evaluation) it states that a property must possess the quality of significance in American history, architecture, archaeology, engineering, or culture; integrity of location, design, setting, materials, workmanship, feeling, and association; and

a) Be associated with events that have made a significant contribution to the broad patterns of our history; or

b) Be associated with the lives of persons significant in our past; or

c) Embody the distinctive characteristics of a type, period, or method of construction; or that represent the work of a master; or that possesses high artistic value or that represents a significant and distinguishable entity whose components may lack individual distinction; or

d) That have yielded, or may be likely to yield, information important in prehistory or history.

In addition, National Register Bulletin No. 38 from the National Park Service advises Federal agencies that traditional cultural properties with traditional cultural significance may be determined eligible for the National Register of Historic Places. "Traditional" in this context refers to those beliefs, customs, and practices of a living community of people that have been passed down through the generations, usually orally or through practice.

Under Section 106 of the NHPA, Federal agencies are required to take into account the effects of their undertakings on all historic properties included in or eligible for the National Register of Historic Places (i.e. "significant" historic properties). Agencies are also required to afford the Advisory Council on Historic Preservation a reasonable opportunity to comment on such undertakings. Included within the Section 106 process is the identification and evaluation (i.e. determination of significance) of historic properties within the proposed project area and an assessment of potential project impacts on all significant properties. Currently within the study area of the Feasibility Study, no systematic or comprehensive surveys on any of the reservoirs have been completed. Further, most of the cultural resource sites which have been identified have not been evaluated for eligibility for listing on the National Register. All sites not evaluated for their significance under the National Historic Preservation Act must be treated as if determined eligible for nomination to the National Register of Historic Places until they can be formally evaluated. Completion of this process is the first necessary cultural resource management task for Federal agencies in addressing or taking into account project effects.

1.2.2 Historical Significance

Archaeological and historic sites are significant for a variety of different reasons based upon their National Register eligibility and as defined by the Criteria of Evaluation described above. The Criteria of Eligibility for the National Register (described above) make special reference to the quality of preservation of sites and their contents, their location, the integrity of setting and materials, and their association with particular ethnic groups or historically known individuals and events. The particular site setting and/or contents may be essential in evaluating and applying research questions about the past. The level of significance varies according to the question asked and the potential of the site for providing relevant information.

Common research themes in regional archaeological investigations have been concerned with culture history (i.e., events in the history of a culture, particularly the sequence and age of those events); different aspects of culture process (i.e., how people in the past carried out certain kinds of activities); and human adaptations in response to environmental changes (i.e., association with natural events such as floods, volcanic eruptions, mud slides, buried soils and forest fires).

Archaeological sites are also important to the heritage of regional Native American groups, however, their primary interest tends to lie not so much with scientific investigations as with protection and restoration of places/resources to the benefit of cultural uses, cultural identities, and values for community and family heritage. Archaeological sites are also of interest to the general public from the standpoint of aesthetics, history, science, or recreation. Finally, some sites are significant for their importance in the context of certain themes, patterns or trends in American history.

1.2.3 The Scales of Cultural Resource Values

1.2.3.1 Large-Scale Resource Values

Large-scale resource values are regional in scope. They include regional ecological patterns, geological conditions, cultural relationships, and cultural features. Reservoir construction and subsequent inundation of a significant reach of a river valley constitutes an important large-scale effect on the environmental context of the resource database. Replacement of the riverine and terrestrial environments with a reservoir system transforms these into a single lake-like environment. A significant body of information about the former ecosystems—including much of the cultural and geological data connected to these systems lying both inside and outside the direct impact zone of the reservoir—is lost during the transformation. For example, the relationships between sites in the reservoir that are directly affected and those sites lying outside the reservoir that are indirectly affected by operation of the pool are altered or possibly destroyed.

1.2.3.2 Medium-Scale Values

Medium-scale values include local patterns of human use, vegetation assemblages, or geological features. This encompasses sites or places where evidence of human use or a particular array of vegetation types or evidence of a geological process can be found. A site is defined as an assemblage of objects and their relationships to one another and with other objects in the ecosystem. For instance, the archaeological context of a site is a set of ordered relationships that result from nonrandom output of human activities arrayed in the same time and space. Establishing a reservoir on a site can alter these relationships by changing the environmental context of the site through the acceleration of erosion. The long-term action of erosive waves and currents along the pool shoreline redistributes objects, altering their spatial context. If enough material is eroded away and objects are displaced from the strata in which they were originally deposited, their time context is also altered.

1.2.3.3 Small-Scale Values

Small-scale values include the objects on a site, such as the artifacts (movable items manufactured by humans) and features (immovable manufactured items) of the site. Since analysis techniques rely on objects or their attributes, the concern is focused on the effects of reservoir processes on objects or artifact assemblages (groupings of associated artifacts) and attributes. Each object, artifact, and feature has a set of measurable characteristics and attributes which carries some information about

human behavior. An irretrievable effect of inundation on artifacts and features is the loss of information about human behavior such cultural remains can reveal. Other objects may be displaced; break apart; or changes in size and weight, shape, or chemical composition. However, such small-scale effects are cumulative and tend to gain significance over time. An example is the initiation of soil mass movement which begins at the soil particle level as water within the soil pores flows away from high pressure areas to lower pressure areas during rapid lowering of a reservoir. As chain reactions result from this small-scale movement, slumping or mass movement develops down slope. This changes the character of the site as well as some attributes of the objects on the site.

1.2.4 Native Peoples: Cultural Resources—The Tribal Perspective

The significance of the lower Snake River and its resources to affected tribes and traditional communities is rich and complex. Descendants of the Palous, Walla Walla, Wanapum, and Nez Perce remain whose families remember having lived in or near this river basin. Some learned their living heritage through participation in altered traditional season rounds, and Indian religious and social customs within the context of lower Snake River environments. The hallowed graves of close and distant relatives are located along this portion of the Snake River Basin. These and other places spoken of in the ancient oral traditions are still recounted by some traditional people causing their significance to merge into people's modern lives. The Snake River is indeed much more than what it may appear to be or represent to resident non-Indian people, (Trafzer and Scheuerman, 1986).

Since tribal cultural resources embrace a broad spectrum of natural resources, the reader's attention is directed to other technical appendices of the Feasibility Study, such as Resident Fish, Wildlife, Sedimentation, Anadromous Fish, Water Quality and Tribal Coordination and Consultation. These technical appendices discuss in detail how each of these resources are affected by the proposed alternatives and indicate the interrelationships among the different resources and river uses.

The following subsections are near verbatim reproductions of tribal statements originally printed in the Cultural Resources Appendix of the System Operation Review, Final Environmental Impact Statement which is intended to summarize the collective Tribal perspective of cultural resources. This information is helpful in understanding the significance of cultural resources as they are perceived by Native American peoples. (For additional information concerning the Tribal perspective please refer to the Tribal Circumstances portion of Appendix I—Economics and *Tribal Circumstances and Perspective* (Meyer, 1999).

This perspective is characterized by a broad, holistic view treating virtually all elements and features of nature as cultural resources possessing cultural significance for tribes/traditional American Indian communities. By contrast, Federal agencies working under Federal law definitions of historic properties with agency personnel who typically have Euro-American academic backgrounds tend to emphasize identification and evaluation of physical sites and artifacts with defined boundaries over traditional cultural properties in management decisions. While tribes and traditional community representatives acknowledge the importance of historic properties, they assert that their definition of cultural resources is broader (extending beyond the definition in the Natural Historic Preservation Act to include natural resources with cultural significance) with focus on traditional cultural properties.

This summary of the Tribal perspective is compiled from written reports provided by various tribes under contract with Federal agencies, statements made by tribal representatives at coordinating meetings, and other sources. It reflects the agency's understanding of what it has heard from the tribes regarding their view of cultural resources. Specific Tribal representatives and sources are quoted verbatim as being representative of general views that we believe the various tribes hold in common. At the same time, the agency respects the uniqueness of each Tribe and does not intend to imply that the tribes can be culturally grouped together. While some beliefs are held in common, other beliefs are quite different.

This summary should not be construed as an expression of agreement by the agency with the traditional Native American perspective on cultural resources. However, it is intended to demonstrate a sincere effort to listen to and understand the Tribal positions in general. It should also be noted that each Tribe may have a specific view that may or may not agree with this summary.

1.2.4.1 The Sacredness of the Natural World

Native Americans have traditionally conducted their lives based on the belief that there is a close physical and spiritual interrelationship between humans and nature. This interrelationship extends from the distant past (time immemorial), to the present, and continues infinitely into the future throughout the physical world. It does not assume that humans are superior to the animals or other aspects of nature but, rather, views human existence as an integral part of the natural and spiritual world. All that exists is alive and sacred. The land, rock, water, air, animals, and humans each occupies a unique role in the universe. They honor their relationships to all natural things. It is for this reason that religion, in the traditional Native American view, is an integral part of life from day-to-day and season to season. Life, for them, is a process of maintaining a balance with the rest of the world and it is this balance which constitutes their world order. Failure to respect the proper place of all things in the natural world would be to upset this balance and could destroy it.

The close bond of the Indian to the natural world is demonstrated in the traditional seasonal cycle of Indian families engaged in subsistence rounds that took them to various places to acquire native food medicines, and other materials (see sections 2.4 and 2.5). For each tribal culture, the annual cycle of subsistence formed an integral part of their cultural fabric. According to the Spokane Tribe of Indians who share a tribal perspective with project-affected tribes:

> *Before the construction of Coulee Dam the Spokane people were dependent upon and interwoven with an annual cycle. The removal of any part of this cycle destroys all opportunity of continuing that cycle. Removal of the salmon and related cultural components by the construction of the dam destroyed traditional Spokane culture. They could no longer carry out a traditional way of life with a significant portion of their economy, diet, and spirituality missing (Review of SOR Draft EIS Appendix D, Cultural Resources, page 4).*

1.2.4.2 Unwritten Knowledge

Native Americans deeply respect tribal elders as the ones who traditionally preserve and transmit cultural information and their language down to the younger generation. Thus, the main body of cultural knowledge contained in tribal traditions and practices is unwritten and the process of teaching it to future generations depends on a personal relationship between elders and the younger Tribal members. This knowledge is sacred and cannot be given to just anyone who asks for it. To

be ready to receive such knowledge takes preparation and discipline. This contrasts with the view of most Euro-Americans who place greater credence in the written word and tend to expect that if someone truly means what they say, they will "put it in writing." Native Americans do not accept this particularly in regard to their spirituality:

> *Now how can you sit across the table and listen to someone like myself or these elders and then put down what kind of impact those alternatives have on our way of life, our way of belief, and our way of teaching? It would be pretty prodigious if you guys can do that. I've been working for eight years trying to learn how to interpret what my elders have been telling me. Many times they won't give you the answer you're looking for. . . . You want answers to your questions. Many times elders will throw another question out there to make you think, to make you sit back and think about all of your future. . . . (Mr. Jeffery Van Pelt, Confederated Tribes of the Umatilla (Corps, 1995).*

From the traditional Tribal perspective, then, the primary and most authoritative source of cultural information comes from elders. As in the work of anthropologists concerned with understanding a culture and its ethnohistory, information from those people with direct cultural experience, and who function in their society's mainstream are usually considered of primary value to the researcher. Tribes generally do not place the same value on the work and findings of professional archaeologists as they do the collective understandings of the elders. In the words of Mr. William Yallup, Yakama Nation:

> *The oral histories would disclose much more than archaeologists can ever find. You have to know the subject matter before you can even talk about it (Corps, 1995: 2-5**).***

1.2.4.3 Tangible and Intangible Impacts

N.R. Bulletin 38 encourages its users to address the intangible cultural values that may make a property historic (N.R.B. No. 38, page 3). From a Tribal perspective, the relationship of their intangible values to various tangible natural and cultural resources is of critical importance. Three examples of this relationship concern salmon, burial sites, and changes due to inundation.

1.2.4.4 Species of Interest: A Natural and Cultural Resource

For affected tribes, there are a wide variety of species of cultural interest found historically within the Lower Snake River Project's ecosystem. Anadromous fish species such as salmonids, and the pacific lamprey are representative of the full breadth of cultural significance in which Indian peoples hold such resources. Salmon were a major food source for most Columbia Basin Tribes. The general cultural significance and the sacred aspect of the salmon is honored in Tribal cultures just as much today as in the past. Traditional ceremonies and the continued respect shown the salmon have helped insure their return to fishing grounds. Indian fisherman revere salmon (Steelhead included) as one of many divinely provided traditional foods, and as a designated "lead fish" essential on the tables at community dinners. A large catch of fish (enough to both sell and give away) brings social esteem to both the fisherman and the skilled salmon handlers who prepare and serve the catch. Stories and religious songs about salmon bond together individuals, families, Indian society, and cultural places with all aquatic species of interest to traditional Indian people. In an attempt to explain the close inter-relationship peoples of the Yakama Tribe have experienced with the land, and how they have long been sustained by their homeland, subsistence places and resources Chief Meninook stated:

God created this Indian country…. He put the Indian on it. They were created here in this country, truly and honestly, and that was the time this river was started to run. Then God created fish in this river and put deer in these mountains and made laws through which has come the increase in fish and game…. When we were created, we were given our ground to live on, and from that time these were our rights.

My strength is from the fish, my blood is from the fish, from the roots and the berries. The fish and game are the essence of my life. I was not brought from a foreign country and did not come here. I was put here by the Creator.

The drastic reduction in salmon runs over recent decades reflects a major cultural loss to virtually all of the Columbia Basin Tribes, and has altered their community life ways. As simple evidence of this fact are the numbers of adjudicated State and Federal cases that Lower Snake River Project affected tribes have been parties to involving treaty fishing rights and interest. Many of these have been litigated at the Federal Supreme Court level.

1.2.4.5 Native American Cemeteries and Graves

Native Americans traditionally believe that continuity in time connects their ancestors with those living today and those yet to be born. It is believed that each person who lived in the past, lives now, or is yet unborn has a name which is preordained. Death does not end kinship or relationships. Thus, the belief that each living or inanimate thing has its own unique place in the universe extends to the spirit world and across time. Therefore, the burial sites of Native Americans are sacred to them and to disturb the remains of an ancestor for any purpose is a sacrilege.

Our elders have taught us once a body goes into the ground, it is meant to stay there until the end of time (Armand Minthorn in Umatilla Position Paper).

1.2.4.6 Traditional Value of Places

Certain places in the landscape are traditionally considered to be of special significance to the tribes. Vision quest sites, social and political gathering places, and sites associated with stories, tribal history or community history, have been inundated or are affected by erosion due to reservoir action. In the tribal perspective, this is a loss of cultural resources and a loss of their culture.

1.2.4.7 Responsibility of Federal Agencies

Federal agencies are responsible for effects to cultural resources caused by their undertakings, including operation of dams. As mandated in such laws as the National Environmental Protection Act (NEPA), the NHPA, American Indian Religious Freedom Act (AIRFA), Federal agencies must consult and collaborate with affected Indian tribes as well as state historic preservation offices and the National Advisory Council on Historic Preservation with regard to proposed project undertakings.

1.2.5 Intrinsic Values

Cultural resources are valued for many reasons including their contributions to aesthetics, artistic expression, humanistic experience, and recreation opportunities. Some of these public values conflict with the need to protect cultural sites. This necessitates public interpretation and education

to foster better appreciation and understanding of the resources, on the one hand, while actively managing resource protection programs to prevent the destruction of the resources, on the other.

1.2.6 Euro-American/Asian-American Site Significance

Some cultural sites are historically significant and of special interest in relation to the period of Euro-American exploration, the fur trade, military history, mining, navigation, agriculture, and early settlement. The Snake River provided the first travel route for Euro-Americans from the Rocky Mountains to the Columbia. Navigation of the river led to exploitation of its resources and establishment of today's settlements. There are many historical sites that are significant because they document this course of development. Examples of transportation developments include river landings, grain chutes, and railroad grades. Also of interest is the role of the Chinese in the industrial exploitation of the Columbia River Basin.

1.2.7 Culture History

Culture history refers to events in the history of a culture, particularly the sequence and age of those events. In such inquiries, the determination of the age of deposits through stratigraphy, radiocarbon dating, and use of volcanic ash, and the age of landforms, such as river terraces, is important. Certain cultural sites become significant for the time period that they represent. Examples of sites important for culture history include Marmes Rockshelter in Lower Monumental Reservoir, Windust Caves in Ice Harbor Reservoir, and Granite Point in Lower Granite Reservoir. These sites are significant because they contain evidence for the earliest human occupations in the lower Snake River canyon between 9,800 and 10,200 years ago before the present (BP).

1.2.8 Traditional Cultural Properties

A traditional cultural property can be defined generally as one that is associated with cultural practices or beliefs of a living community that are: rooted in that community's history, and important in maintaining the continuing cultural identity of the community.

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2. Cultural Resources: Existing Environment

2.1 Overview of Area Prehistory

During the period of earliest human occupation, 13,000 to 8,000 years BP, people occupying this area are believed to have foraged for a wide variety of food resources located in different topographic zones. The time between 8,000 to 4,000 years BP witnessed a warming trend and a shift toward more use of plant foods and aquatic resources including salmon and freshwater clams. From 4,500 to 2,500 years BP, people in this area developed pithouse (a semi-subterranean dwelling) villages and further intensified the use of plant and aquatic foods, e.g. clams. From 2,500 to 250 years BP, the number of pithouse village sites expanded as did the use of salmon and plant foods. The bow and arrow was introduced during this time. The last 250 years coincide with the historic and ethnographic period from the acquisition of the horse by native peoples in the early 18th century to their displacement to reservations in the mid-19th century and the settling of the area by Euro-Americans.

Prehistoric peoples lived in villages along intermediate and major sized streams. Temporary camps were also used but only for short periods of time or for special purposes. Food resources consisted of various species of fish (primarily salmon and steelhead), plants, and animals collected during an annual subsistence round based on the time of year each food source was available.

The prehistory of the lower Snake River Basin may, like much of North America, span approximately 13,000 years. However, of the few archeological sites thought to be of this age more research is needed for scientific confidence in these early dates and little is currently understood of theses early cultural remains. More conservative views of early human prehistory place the earliest human occupants or Paleo-Indian cultures in the Snake River Basin between 10,000 to 8,000 years BP. During this time, small numbers of native peoples may have inhabited large territories, traveling within them to exploit seasonally or locally abundant resources, especially large hoofed mammals. People relied on residential mobility rather than intensive food production and storage to overcome seasonal food scarcity. Where conditions were favorable, people exploited mammoth, mastodon, camel, and horse, which became extinct during or shortly after this period. Paleo-Indians also hunted species such as bison, mountain sheep, and deer, which were larger than their modern descendants (Butler, 1986).

Prehistoric peoples also exploited favorable fishing sites, such as stream confluences and river narrows, only seasonally during this time period. Peak salmon runs made salmon harvest at these sites efficient at certain times.

The time between 8,000 to 4,000 years BP was characterized by a continental warming and drying trend (Aikens, 1993). This influenced the distribution of vegetation zones. The modern climatic pattern was established by approximately 4,000 years ago. While local inhabitants continued to occupy the area in low numbers and relied on residential mobility, there was a shift towards using more plant foods and aquatic resources including salmon and freshwater clams. Sometime around the beginning of this period the spear thrower and dart replaced the thrusting spear as the dominant weapon technology.

From 4,500 to 2,500 years BP, people in the area developed pithouse (a semi-subterranean dwelling) villages and further intensified the use of plant and aquatic foods. Between 2,500 to 250 years BP, the number of pithouse village sites expanded as did the use of salmon and plant foods. The bow and arrow was introduced at the beginning of this period. Population densities continued to grow throughout this period (2,000 to 1,855 BP) and food production/harvest processes were intensified.

Greater use of upland/mountain ecosystems and the historically observed system of food storage, particularly of dried salmon, tubers, and berries for winter consumption characterized this time period. By the 1700s, local southern Plateau Culture Area bands had well established homelands that encompassed sections of the lower Snake River. These peoples spoke languages from the Sahaptian language family and are known in the literature as the Nez Perce, Palous, Cayuse, and Walla Walla. Other peoples including those of the Wanapum, Umatilla, and Moses bands cross-utilized the homelands of the established Snake River bands.

2.1.1 Lower Snake River Archaeological Sequence - Leonhardy and Rice

In 1970, Leonhardy and Rice developed a cultural sequence for the lower Snake River that has become the hallmark approach to defining archaeology along this stretch of the river. It is based on the analysis of artifact assemblages from 19 sites which happen to be within the Feasibility Study area. The research data was organized into four time periods and six phases (Figure 2-1). The time periods included the Pioneer, Initial Snake River, Snake River, and Ethnographic. The Pioneer period encompassed the late Paleoindian Windust phase and the early to middle Holcene Cascade phase. The Initial Snake River period included the Tucannon phase, dating from about 4,500 to 2,500 BP.

While the Cascade phase was believed to have evolved out of the earlier Windust phase, no such continuity was assumed between the Cascade and Tucannon phases.

The Snake River period extended from about 2,500 BP to historic contact, and was seen as a continuum of in place development with its roots in the Tucannon phase. Two phases are included in this period, the Harder and Piqunin. The Harder phase was further divided into an early and late subphase. Early Harder assemblages date from ca. 2,500 BP to about 1,000 BP, and late Harder assemblages from about 1,000 to 700 BP. The subsequent Piqunin phase dated from 700 BP to "before AD 1700" (300 BP). The Ethnographic period included only the Numipu phase, which lasted from about AD 1700 (300 BP) to contact.

Phases were defined in terms of both their formal content and restricted distributions in time and space.

2.2 Native Peoples

At the time Euro-Americans arrived in the Pacific Northwest they found numerous Indian groups living throughout the Columbia River Basin. Evidence for the long presence of native peoples in the region is indicated by the large geographic distribution, and diversity of dialects represented in the languages belonging to the Penutian language stock. Historically, the lower Snake River was occupied by numerous bands of Indians peoples who spoke dialects of the Cayuse, Northeast Sahaptin and Nez Perce languages. While most of these native languages are still spoken, Cayuse survives only as a small vocabulary group inter-mixed into the other two languages. Middle

Snake River Sequence

Date (B.P.)	Phase	Artifact Assemblage		
Present	**Numipu**	Euroamerican trade goods Decrease in Aboriginal Technologies		
250				
500	Late Subphase	Small corner notched points	Pestles	Cobble spall scrapers
1000	**Harder**	Lanceolate & pentagonal knives	Net weights	Hopper mortar bases
		Small end scrapers	Expanding stemmed points	Bone awls & needles
1500		Bone Beads	Twined basketry & cordage	Shell Artifacts
2000		Utilized flakes	Perforated elk teeth	(Olivella & Dentalium)
		Rectangular stemmed points	Decorated pestles	
2500	Early Subphase	Composite harpoon elements	Bone matting needles	
3000	**Tucannon**	Contracting stemmed points	Bone shuttles	
		Corner & side notched points	Pounding stones	
3500		Side & end scrapers	Hopper mortar bases	
		Net weights	Cobble spall scrapers	
4000		Pestles	Utilized flakes	
		Utilized cobble spalls	Antler wedges	
4500		Bone awls		
5500	Late Subphase	Cold springs side notched points	Large utilized flakes	
5000	**Cascade**	Lanceolate (Leaf-shaped) point	Pounding stones	
6000		Large lanceolate & triangular knives	Manos	
		Tabular & keeled scrapers		
6500		Large cobble spall scrapers		
	ca 6700 Mazama Ash	Small grinding stones		
7000		Edge ground cobbles	Bone needles	Bone awls
7500	Early Subphase	Bone atlatl spurs	Atlatl weights	Olivella beads
8000	?	Straight or contracting stemmed points	Scrapers	
8500		Uniface & biface lanceolate points	Uniface & biface choppers	
9000	**Windust**	Lanceolate & oval knives	Utilized spalls	
9500		Multiple faceted burins	Bone needles/awls	
10,000		Large cobble scrapers	Olivella beads	
10,500		Utilized flakes		
11,000	?	Bone atlatl spurs		

Figure 2-1. Archaeological Chronology for the Lower Snake River

Source: Leonhardy and Rice, 1980 (revised version)

Columbia and lower Snake River bands shared subsistence based economies supported by hunting, fishing and foraging. Political organizations consisted of loosely associated villages of family groups, each village with its own general territory and leadership. While these bands were fairly distinctive, they shared similar customs, languages, and jointly used major subsistence, and trade markets. Native bands also formed a larger southern Plateau Culture Area society through economic and political alliances.

Native life ways were based upon subsistence economies, which required families to observe annual seasonal migrations throughout their homelands and to places elsewhere within the region. People harvested foods as they became ready and participated in a trade network involving a other bands. The seasonal activities of the Sahaptian-speaking people is fairly representative of the subsistence practice throughout the non-mountainous parts of the Columbia River Basin in early historic times (Hunn, 1990). In general, these peoples lived in winter villages near the Snake River or on the lower reaches of its major tributaries, subsisting on food stores during the winter, supplemented by hunting and fishing. They lived in large, multifamily lodges covered with tule mats.

In early spring, families harvested vegetable foods from the plains and riverine foothills, and fished the spawning runs of suckers in major rivers and primary tributaries. Later, they roamed uplands further from the winter villages to collect bitterroot and other vegetable foods for long-term storage. In May, they went to favorite fishing sites on the main river for the spring chinook runs. By late May flooding made fishing difficult, so they went to the mountains to escape the summer heat, and to harvest and dry large quantities of huckleberries, and hunt deer and other game.

Sahaptian speaking peoples returned to the river to harvest anadromous fish species between July and October. Of great dietary importance was the fall chinook which came up stream during September. The chinook salmon runs produced large quantities of stores for winter food. It is estimated that as much as one third of the southern Plateau Area peoples' annual diet may have come from aquatic resources such as salmonid fish species. Food plants may have supplied an additional 50 percent of their annual food supply, with game and huckleberries making up much of the remaining amount (Hunn, 1990).

Seasonal subsistence rounds took family groups from winter villages within major river basins to seasonal camps and subsistence sites throughout the uplands. With the introduction of the horse in the mid-1700s, the range of trade and subsistence rounds for some bands (e.g. Nez Perce) greatly increased. Bison hunting on the plains became an annual or frequent activity that resulted in elements of the Plains culture being introduced into the Plateau Culture Area. The Snake River was an important winter refuge and a primary source of subsistence fishing during the spring and fall. Fall and winter big game activity, and spring through fall plant gathering activities completed the seasonal round of life of Snake River bands. Trade contacts evened out some of the inequities of resource availability in any given bands' territory and brought these Indian groups together into large inter-related economic and political networks. Plateau Cultures such as the Nez Perce, Cayuse, Walla Walla, Umatilla and Palous were internally pacifistic, but could be intensely aggressive towards Indian groups from outside the southern Plateau, e.g., Blackfeet tribe of the Great Plains and the Northern Paiute of the Great Basin.

Horses were traded into the southern Plateau from New Mexico some time after 1730, changing native peoples' mobility, warfare, and subsistence logistics. European diseases such as smallpox

arrived with the crews of exploring oceanic vessels even before trading ships began to arrive on the Pacific coast in the 1790s. Northwest Indian populations declined dramatically after 1770 because of introduced diseases. By 1830, the Northwest had lost approximately 50 percent of its native population to disease (Boyd, 1985) and more than 80 percent by 1870. Prior to the arrival of settlers overland from America, relations between Indians and Euro-Americans were mostly amicable and governed by mutual interest in trading of furs, foods and other items for manufactured goods.

2.2.1 The Historic Period

European and American influence began in the early 1700s with European trade items transported into the Snake River Basin by Native American traders. First contact with Euro-Americans in the region was made in 1805 when the Nez Perce encountered the Lewis and Clark Corps of Discovery. The Lewis and Clark Corps of Discovery followed the course of the lower Snake River, traveling through the homelands of the Nez Perce, Palous, Cayuse, and Walla Walla, on their journey to reach the Columbia River and the shores of the Pacific Ocean (Coues, 1893).

Beginning in early 1855, the United States Government entered into a series of treaties with many of the Plateau Culture Area tribes/bands. Some Columbia and Snake River area bands participated in the treaty council held by Oregon Territorial Governor Isaac Stevens at Walla Walla. This treaty formally created the Federally recognized tribes of the Yakama, Umatilla, and Nez Perce. Plateau tribes like the Warm Springs were formed through the Middle Oregon Treaty, and the Salish-Kootenai tribes through the Hell-Gate Treaty. These treaties were all negotiated in 1855 and are sometimes referred to as Stevens Treaties after Oregon Territory's Governor Stevens who was the lead US government negotiator. Treaty making in the 1860s further defined the Nez Perce reservation and tribal rights. As non-Indian settlers and miners began moving into the region between 1855 and 1880, conflicts arose with the local tribes, resulting in the Indian wars of 1855-58, the Snake War of 1866-68, the Nez Perce War of 1877, the Bannock-Paiute War of 1878, and the Sheepeater War of 1879. The Governor Stevens treaties with Plateau bands required these Federally recognized tribes to relinquish part of their homelands as defined by Stevens, known as "ceded lands." However, through treaty negotiations these tribes retained certain pre-existing rights allowing them to fish at usual and accustomed areas, and hunt, gather, graze livestock on open and unclaimed lands.

2.3 Cultural Resources: Affected Area

Cultural resources are found throughout the Snake River system. Most scientific information generated about them has been the result of archaeological studies associated with the construction of Federal dams in the area of this study. There is, however, more than one view of what constitutes cultural resources. The academic and legal definitions, while including many aspects of culture, tend to focus on tangible evidence, such as sites and artifacts. Many traditional communities and some Anthropologists find such emphasis and corresponding resource definitions to be limiting. Local tribes view their unique heritage, and cultural/spiritual relationships with the earth and natural resources as being connected with and affirmed by cultural resources. In the tribal view, natural resources are an integrating aspect of cultural resources, and impacts to them should be addressed and understood together in the context of traditional cultures. These somewhat differing interpretations of Federal legislation reflect how various groups of people would have cultural and natural resource laws operationally interpreted by Federal agencies.

The following discussion is based on the more narrow definition of cultural resources. The expanded, traditional tribal view of cultural resources is addressed in the Tribal Circumstances and Perspectives Report (Meyer, 1999).

2.3.1 Cultural Resource Management

The legislative foundation for the Cultural Resource Management (CRM) era was established through the NHPA and the National Environmental Preservation Act of 1969. Strengthened by subsequent amendments and legislation, and by the establishment of a national Advisory Council on Historic Preservation with oversight responsibilities and State offices of historic preservation, the NHPA, Section 106 review process evolved rapidly. Since the end of the reservoir impoundment era, the focus of CRM in the Snake River Basin has shifted from large scale salvage programs to the identification and evaluation of cultural properties, and, where appropriate, determination of effect studies of proposed impacts to them.

By the mid-1980s archaeological attention began to shift away from the lower Snake River canyons to the adjacent uplands. This change in CRM focus was prompted both by logic and necessity. Logic as expressed in the new Binfordian (from Lewis Binford, a major archaeological theoretician) regional research designs which required that whole basins be considered, not just riparian strips. Just as important was the compliance mandate imposed on government agencies to inventory and manage cultural resources. Much of this inventory work and resource documentation was done in-house where it remains largely inaccessible to researchers, public education forums, and American Indian tribes.

Between 1947 and 1954, most of the planned dam sites and reservoirs for the Columbia River system were surveyed by Smithsonian archaeologists. Salvage operations were then carried out at The Dalles and McNary Dam projects. The Smithsonian conducted these early archaeological surveys, known as the River Basin Surveys, from a field office at the University of Oregon. These surveys also extended to the lower Snake River region. During this era, about 10 percent of the inventoried sites were partially excavated prior to inundation or construction impacts.

After 1955, the National Park Service administered archaeological surveys in this area from its Western Regional Office in San Francisco. Working through regional colleges and universities, these activities prompted the major universities to establish and maintain an inventory of archaeological site records. Most of this original inventory information was passed on to the respective State Historic Preservation Offices during the 1970s, following their creation under the NHPA. During this time, about 5 percent of sites inventoried in the project areas were sampled before they were destroyed or inundated. Since the 1974 amendment to the Reservoir Salvage Act of 1960, Federal agencies such as the Corps have professionally managed cultural resources activities under their jurisdiction at the Federal reservoirs.

2.4 History of Cultural Resources Surveys

The United States National Museum conducted the earliest professional studies describing cultural resources in specific Columbia River Basin reservoirs (H.W. Krieger, 1927, 1930). This research stemmed from the construction of Bonneville Dam.

The Federal government did not actively participate in cultural resources activity in the Columbia River Basin until the Corps, the National Park Service, and the Smithsonian Institution signed the 1945 Interagency Archaeological Salvage Agreement.

2.5 River Basin Surveys

As the Second World War drew to an end in the summer of 1945, the Corps and the Bureau of Reclamation began plans to implement a nationwide program of dam and reservoir construction, with much of the effort focused on the Missouri and Columbia-Snake basins. Plans to dam the lower Snake River accelerated after 1950 with the intensification of the Cold War and increased demands for hydropower to manufacture aluminum (Ashworth, 1977: 88). The National Park Service and Smithsonian Institution became involved when the potential impact to archaeological resources was recognized, establishing an office of River Basin Surveys. The chief of the survey office warned that "about 80 percent of the archaeological remains in this country are located in places where the damming of rivers and the formations of reservoirs will obliterate them for all time" (Roberts, 1948: 13).

Funding was so limited and time so short in the late 1940s that data recovery excavations were initiated in only nine reservoirs. Only one of those nine (McNary) includes shoreline on the Snake River. Eventually, the Columbia Basin Project of the River Basin Surveys conducted reconnaissance surveys of the Ice Harbor, Little Goose, Lower Monumental, and Lower Granite reservoirs on the lower Snake River.

Unfortunately, lack of time and adequate support for the River Basin Survey teams resulted in a series of hastily produced mimeographed reports (Sprague, 1984a) that badly underestimated the quantity and variety of cultural resources in the lower Snake region. It has been observed that in the Lower Granite Reservoir "the initial survey found seven sites, while a later survey reported almost one hundred sites" (Sprague, 1973: 262). The first River Basin Survey report for the lower Snake recorded 15 sites in the Ice Harbor flood pool, 10 at Lower Monumental, 19 at Little Goose, and 12 at Lower Granite (Osborne, 1948). It is unclear whether the Lower Monumental flood pool was ever reexamined before inundation, but a re-survey of the 94 mile (151 km) perimeter of the Little Goose flood pool recorded 71 sites (Nelson, 1965).

2.6 Reservoir Impoundments

The era of reservoir impoundment along the middle and lower Snake River lasted only 22 years, yet created a total of 289 miles of artificial pools behind McNary (1953), Brownlee (1958), Oxbow (1961), Ice Harbor (1961), Hells Canyon (1967), Lower Monumental (1969), Little Goose (1970) and Lower Granite (1975) dams. Salvage excavations were conducted on known sites in order to recover important scientific information before the raising of the reservoirs. An unprecedented volume of archaeological data in the form of site reports and academic theses and dissertations were produced. Nevertheless, few of the rescued site assemblages have been reported in a complete fashion, and many have never been analyzed or even described. A major challenge for future cultural resources management studies will be the analysis, description, and synthesis of Corps archaeological collections. Both cultural resource management needs, and considerable research opportunities exist for resources accessible in reservoir systems' fluctuation and indirect impact zones.

2.7 Lower Snake River Cultural Resources

A complete survey and evaluation of all known sites has not been accomplished at any Federal project. This is attributed to the varying levels of archaeological investigations, which have been conducted at each of the projects.

The majority of the archaeological research in the lower Snake River occurred in response to plans to construct hydropower facilities. This work identified most of the prehistoric sites now known for the lower Snake River Basin and retrieved some scientific information before the proposed reservoirs were flooded and access to certain sites was lost. A minority of sites and archaeological districts was evaluated for eligibility for listing on the NRHP during and shortly following this time period. In recent decades, federal funding for such archaeological work has not been available. Consequently, cultural resources management has focused on areas needing immediate protection near known sites, inadvertent discovery sites, and/or federal activities.

A general overview, gathered from what is currently known, is presented here. There are approximately 375 known archaeological sites located within the four lower Snake run-of-river reservoirs (Lower Granite—136; Little Goose—76; Lower Monumental—103; and Ice Harbor—57). This is a number reflected by the geographic information system database of the Walla Walla District. The number changes periodically when sites are discovered and recorded. Cultural resources will continue to be discovered well into the future as much of the Corps land in the lower Snake River has not been systematically surveyed.

Identified prehistoric sites include villages, fishing sites, burials, rock art (pictographs and petroglyphs), storage pits, and temporary camps. Historic sites include homesteads, mining sites, forts, town, and trading posts. At present, two archaeological districts (Windust Caves and Palouse Canyon) and three sites (Burr Cave, Marmes Rockshelter, and Hasatino) are listed on the National Register of Historic Places. In addition to National Register status, Marmes Rockshelter is also a designated National Historic Landmark.

2.7.1 National Register Sites and Districts

The following list contains the names of the National Register sites and listed or eligible districts (a group of closely associated archeological sites based on NHRP criteria) at Federal Snake River system dams and affected reaches. Sites included in the following list represent about ten percent of known sites that the Corps manages in the lower Snake River.

National Register Sites and Districts at the Four lower Snake Reservoirs

1. Ice Harbor Dam, Lake Sacajawea (Walla Walla District, Corps of Engineers)
   a. Windust Caves Archaeological District (listed)
   b. Burr Cave (listed)
2. Lower Monumental Dam, Lake West (Walla Walla District, Corps of Engineers)
   a. Palouse Canyon Archaeological District (listed)
   b. Marmes Rockshelter (National Historic Landmark)
3. Little Goose Dam, Lake Bryan (Walla Walla District, Corps of Engineers)
   a. No sites currently listed or determined eligible
4. Lower Granite Dam, Lower Granite Lake (Walla Walla District, Corps of Engineers)
   a. Hasotino Archaeological Site (listed)
   b. Archaeological sites 45-WT-78/79 (determined eligible)

3. Geomorphology and its Relationship to Cultural Resources

3.1 Geochronology/Geological History of the Region

In the Snake River Basin the measurement of time intervals on a geological scale has involved the dating of rates of sedimentation, flood sequences, ancient soil deposits, and volcanic ash deposits. Fryxell (1963) summarized geological data from archaeological sites between the Ice Harbor and Lower Granite floodpools, and paleontological sites from the Palouse Hills and Channeled Scabland.

Fryxell interpreted the postglacial alluvial history of the lower Snake River as follows: Detailed geological examination of archaeological sites in the lower Snake River canyon confirms the presence of human cultural materials associated with stream gravels on narrow low-level erosional terraces, gravel bars, and in caves above the present high-water marks. The absence of late-glacial Touchet sediments on these gravel bars and terraces, inclusion of remains of extinct bison species in them, and deposits of volcanic ash on them bracket their development as no older than very late or immediate post glacial, and no more recent than the Thermal Maximum.

A composite geoarchaeological chronology for eastern Washington was prepared by Fryxell and Daugherty (1963) and is reproduced here in Figure 3-1. It shows the relationship between postulated shifts in vegetation, climate, material culture, and inferred human economy for the Anathermal (14,000 to 8,000 BP), "Thermal Maximum" (Hypsithermal or Altithermal, 8,000 to 4,000 BP), and Recent periods. Anathermal dating is supported by comparative typology of cultural materials recovered from the archaeological sites. The Anathermal terraces themselves are minor scars incised in constructional terraces, which bear giant ripple marks produced by Scabland floods and a veneer of Touchet silts and sands. Thus the position of the Snake River throughout most of its course from Lewiston to the Pasco Basin has remained essentially stable since the close of glacio-fluvial discharge into the Snake from the Cordilleran Ice Sheet. Similar conclusions appear valid for many segments of the Columbia River above its confluence with the Snake.

Accumulation of floodplain loess (wind blown soil) along the entire valley, at a period when flow of the Snake was at least as low as now and possibly lower, occurred during Altithermal time, though the upper and lower time limits of deposition have not yet been firmly established. Radiocarbon dates from hunting camps and village sites show that accumulation of this loess has not continued during the last two thousand years, but has locally been replaced by erosion and redeposition of windblown sand.

Rapid erosion of these finely textured flood-plain deposits coincided with homesteading and agricultural development of the Columbia Plateau, which continues today at an accelerating pace. Reactivation of large dune areas occurred simultaneously (Fryxell, 1963: 11-12).

3.2 Late Pleistocene Floods

Accurate dating of the aggradation of the Snake River behind flood debris that plugged the canyon above the confluence with the Palouse became a major research problem during the 1960s and 1970s. Data recovery excavations in the Lower Monumental and Lower Granite floodpools had as one objective the establishment of the absolute "basement" dates called for by Fryxell in 1963.

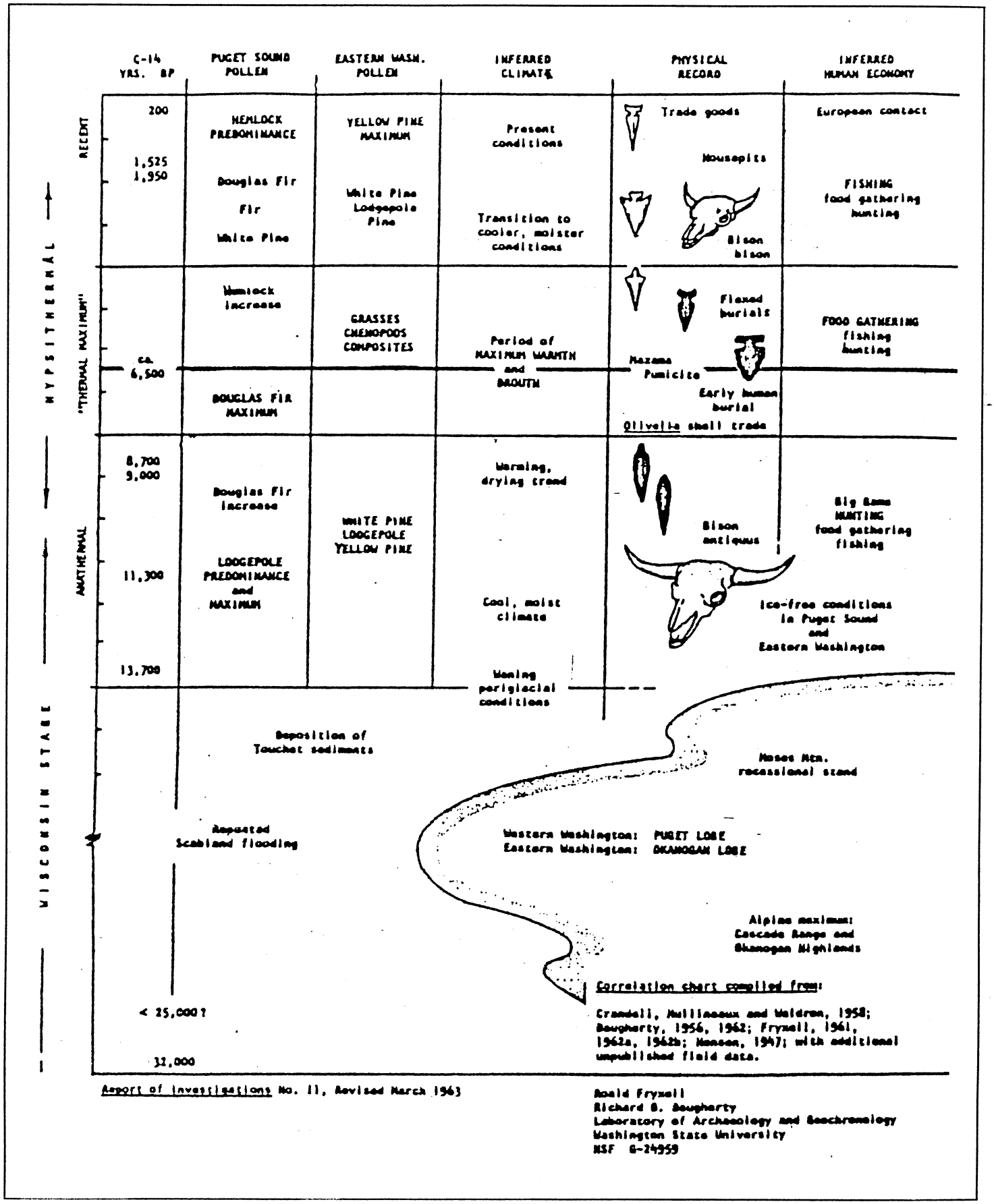

Figure 3-1. Geochronology for the Lower Snake Region

Source: Fryxell, 1963

Slackwater sediments found in Wawawai, Steptoe, and Alpowa canyons and at Granite Point were interpreted by Leonhardy (1970: 70-71) as evidence for a late Pleistocene lake that stood at an elevation of 900 feet (274 m). The lake was attributed to backflooding from a discharge from glacial Lake Missoula that occurred at about 12,310 BP, based on interbedded lenses of Glacier Peak ash. The age for the Glacier Peak ash came from a radiocarbon date of 12,310 +/ -- 310 BP obtained on shells of freshwater mussels found in pumice in lower Grand Coulee (Fryxell, 1965: 1288-1289).

Leonhardy suggested that the lake drained between 11,000 and 10,000 BP, or about 1,300 to 2,300 years after it formed, and that the first humans came into the lower Snake River valley between 11,000 and 9,000 BP, probably about 10,000 BP (1970: 71-73).

Hammatt (1977: 173) argued that the last of the scabland floods from glacial Lake Missoula swept up the Snake River canyons and drained out again sometime after 14,000 -13,000 BP, but before 10,600 +/-- 200 BP (Figure 3-2). The earlier date range was based on charcoal and St. Helens S tephra found in sediments beneath slackwater deposits. The latter date is from cultural deposits at Wildcat Canyon on the lower Columbia River, which Hammatt called the earliest archaeological date within the scabland drainage.

Hammatt suggested that:

> *…it was entirely possible that people may have been present in the Snake River canyon when it was filled with flood water to depths of over 500 vertical feet (152 meters). It is possible that the earliest documented occupation in the canyon is limited in time depth not by the arrival of the people, but by the selective preservation of only those sites which post date the last flooding episode.*

The earliest consistently and securely dated human occupation in North America is the Clovis culture, which flourished between 11,500 and 11,000 years ago (Haynes, 1982: 383). So far, the only dated Clovis site in the Pacific Northwest is the East Wenatchee cache (45DO432). Here, particles of Glacier Peak ash incorporated into silica accretions on the undersides of two superimposed cache blades indicate that the artifacts were deposited on a ground surface 11,250 years old (Mehringer and Foit, 1990).

The distinctive fluted lanceolate points of the Clovis culture have not yet been found in situ in the lower Snake region. This absence, coupled with the above hypotheses concerning the chronology of backflooding from the glacial Lake Missoula discharges, has led several archaeologists to suppose that the early Holocene Windust culture moved in to a blank slate of a landscape when they settled the Snake River canyons about 10,000 BP.

Thus in Leonhardy's interpretation, early Paleoindian (Clovis) cultures could not occur in the lower Snake because the canyons were flooded by a great lake during the crucial interval between 11,500 and 11,000 BP. In Hammatt's interpretation (Figure 3-3), early Paleoindian hunters may have camped in the valley, but their traces were probably removed by catastrophic backflooding between 13,000 and 10,600 BP.

An alternative interpretation is suggested by the following observations. First, at Marmes Rockshelter in the Palouse canyon, there are radiocarbon dates on cultural remains of 10,800 +/-- 300 and 10,750 +/-- 300 (Sheppard et al., 1987: 122). These are slightly earlier than the Wildcat Canyon date and may indicate that people have been in the study area since at least 11,000 BP. An

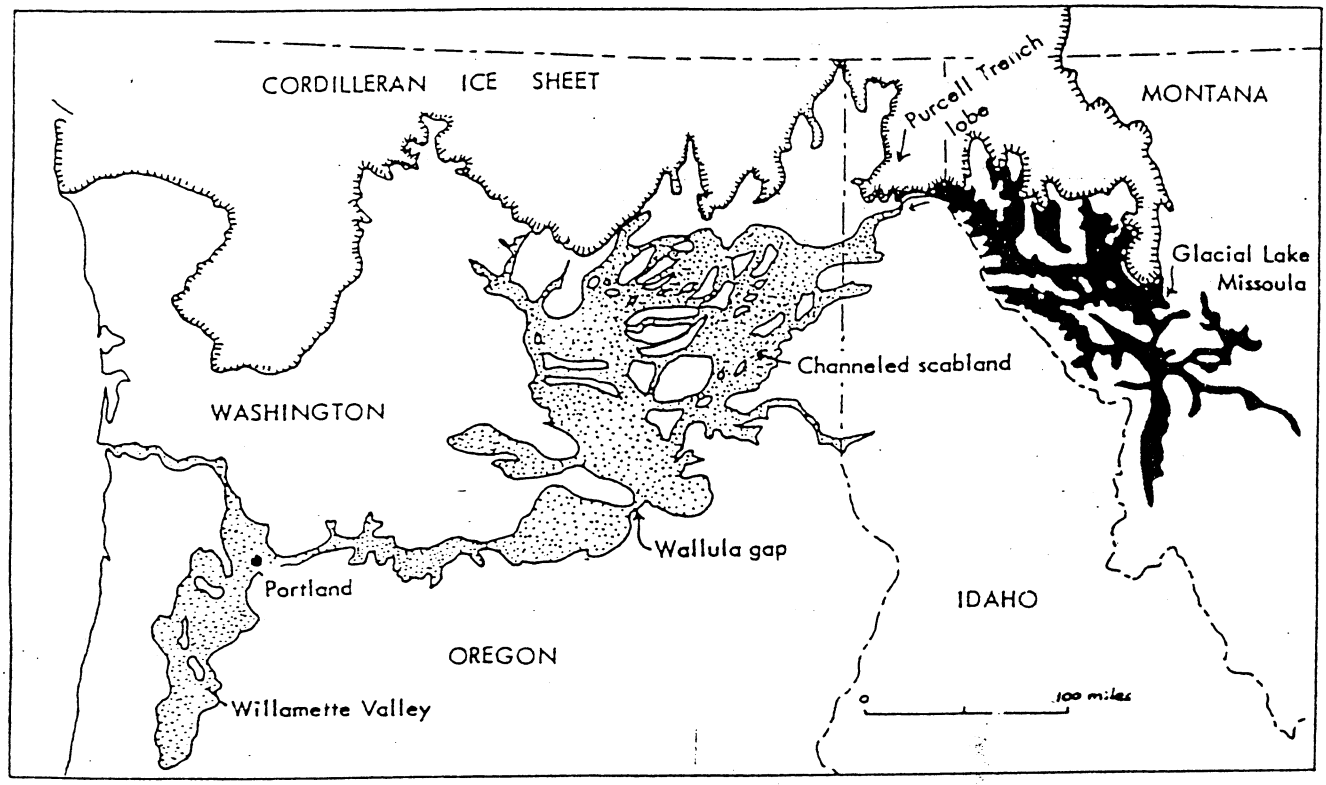

Figure 3-2. Area of Pacific Northwest Affected by Missoula Flood Between 15,300 and 12,700 BP

Source: Maley, 1987: 165; and based on Waitt, 1985

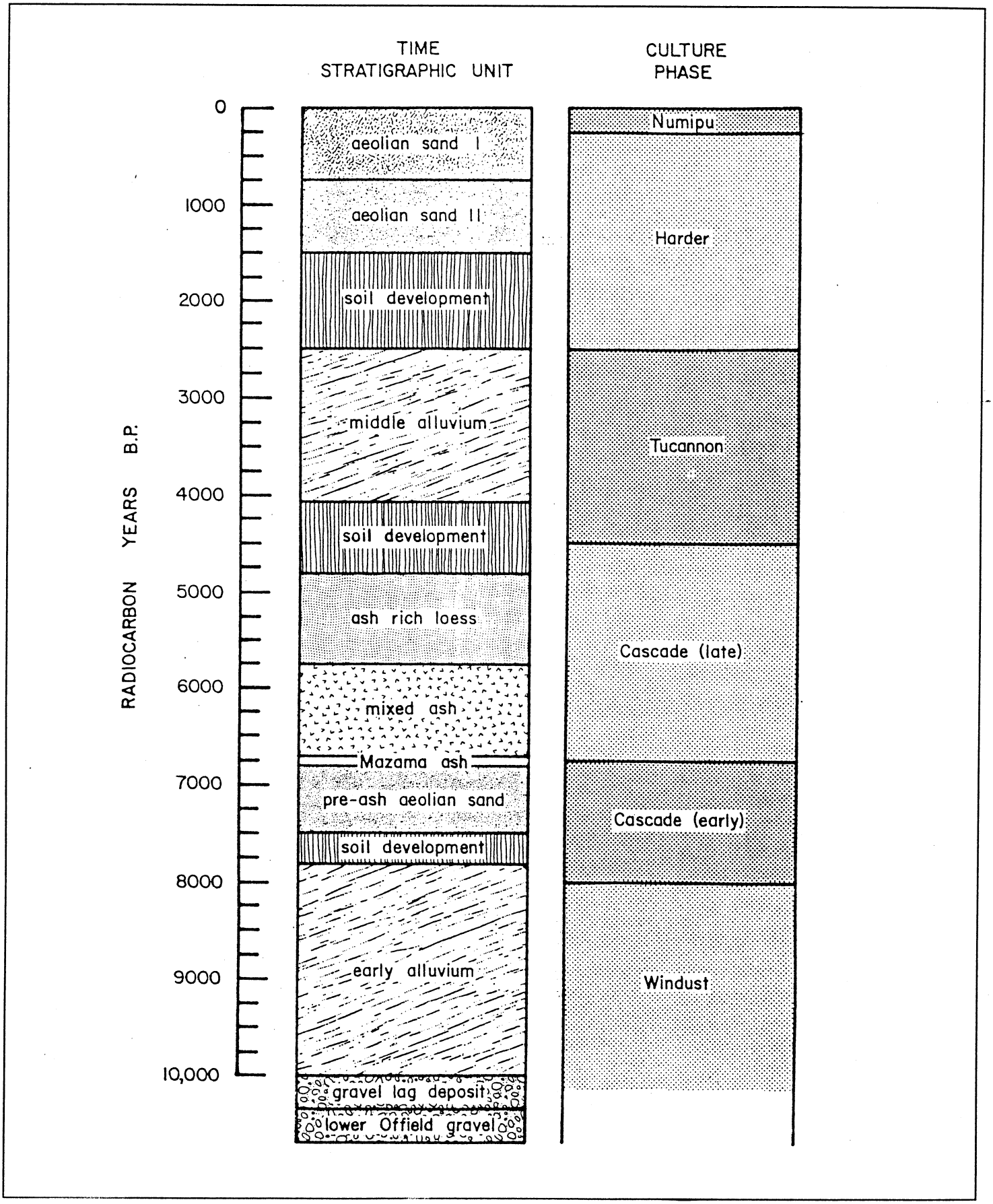

Figure 3-3. Relationships of Late Quarternary Stratigraphy with Cultural Chronology **Source:** Hammatt, 1977, figure 47

unidentified tephra layer occurs below these dates at Marmes; given its position it is probably either the Glacier Peak or St. Helens ash (Sheppard et al., 1987: 121). The former is now dated at 11,250 BP (Mehringer et al., 1977), the latter at about 13,000 BP (Mullineaux, 1986: 20). The implication is that the lower Palouse canyon and presumably the lower Snake River valley did not experience catastrophic backflooding after 11,250 BP and perhaps not after 13,000 BP.

Second, the rhythmic slackwater beds in backflooded canyons, seen by Leonhardy as evidence of turbidity currents in a great late Pleistocene lake that backed up the Snake River from the Wallula Gap, have recently been reinterpreted as individual flood events produced by scores of separate floods. Instead of one or a very few great floods between 22,000 and 18,000 BP (Baker, 1973), the most recent hypothesis now posits 40 or more floods resulting from repeated filling and emptying of glacial Lake Missoula during a 2000 to 2500 year interval between 15,300 and 12,700 BP (Waitt, 1985: 1283-1285).

One implication of the Waitt hypothesis is that the study area was available for Clovis occupation between 11,500 and 11,000 BP. Whether early Paleo-Indians actually did settle in the lower Snake River canyons remains to be learned.

3.3 Major Geologic Features of the Lower Snake River Basin

The northwestern Snake River Basin consists of the Northern Hills, composed principally of the Palouse Hills and the eastern tract of the Channeled Scablands in southeastern Washington. The Northern Hills slope downward gradually from the northwestern arc of the Northern Mountains region toward the Columbia River. The area includes about 3,782 square kilometers, almost all of which is below 1,219 meters in elevation. The lowest point of the region is at 78 meters (256 feet) in elevation at the confluence of the Snake with the Columbia.

3.4 Geomorphic Evaluation of the Project Area

There are strong relationships between geomorphic, ecological and cultural elements of the environment. Although many of the cultural and ecological values have not been studied in detail or may not be widely understood, geomorphic conditions are generally studied and reasonably well understood. The geomorphic analysis procedure can also be adequately performed at the level of detail appropriate for an EIS without the need to undertake additional investigation. For instance, the soil and geologic materials and physiography have been mapped and generally analyzed at a regional level. Regional hydrology is also well documented in other appendices. Also, the formulation of management and protection plans for the physical preservation of cultural resources can be undertaken. (See Appendix E—Existing Systems and Major System Improvements Engineering and its section entitled, “Cultural Resources Protection Plan.”)

The procedure is based on deductive reasoning. It will predict how certain material elements of cultural resources will respond when geomorphic processes act on them. This is necessarily a qualitative analysis of effects to cultural resources that considers the complex interplay between the susceptibility of different landforms to erosion effects; the strong influence of system operational features on reservoir environments, and the generally high density of cultural resource values that are associated with these landscapes. To some extent, local Corps’ knowledge or operational lore is used as the basis for generalizations concerning how the lower Snake River hydropower system operate and the effects of the operational features on landforms. This knowledge is combined with

the accumulated experience and information gained from cultural resource evaluations following past Federal actions in the Snake River Basin.

The analysis also assumes that cultural resource values are a fundamental part of the environment and whatever affects one part would, or may also affect other parts. Given the broad definition of cultural resources and their complex inter-relationship, significant cultural values occur on all landform types. Landforms that are too steep for habitation, for example, may have spiritual significance stemming partly from their inhospitable or inaccessible location. Cultural resource values associated with such sites may be particularly significant because of their rarity. These sites also have archaeological significance because they can provide information about specialized activities and events that would remain unknown if such areas were overlooked. Inundation, erosion and landform change at any place in a reservoir is therefore a potential concern for cultural resource management.

3.5 The Alternative Pathways

Three types of Study Pathway alternatives currently exist:

1. Under the Existing Operation Alternative, the project reservoirs would operate as originally designed with no modification.

2. Under the System Improvement Alternatives, maximum fish transportation either with or without system improvements would be stressed.

   The first two alternatives impact cultural resources in the same ways. For the most part, geomorphic processes have reached a near-equilibrium under operations since the impoundment of the reservoirs. Reservoir adjustments to optimize hydropower production, commercial navigation, irrigation, and recreation have caused numerous impacts. Ongoing erosion has stabilized to some extent on the reservoirs. Some of this effect is due to bank stabilization structures in place at various locations designed to slow or halt erosion.

3. Under the Natural River Drawdown Alternatives, the lower Snake River would be returned to free-flowing conditions. Some existing bank stabilization measures could be made superfluous by the free-flowing alternative. Many, however, would still provide a level of protection from impacts other than those for which they were originally designed.

3.6 Impacts of Erosion and Sedimentation Process

The effects of a reservoir on its environment begin before the impoundment is filled. The effects of vegetation clearing and earth-moving are primarily mechanical. They are to some extent temporary in nature, although the rearrangement of certain physical elements of the environment is permanent. Because this study addresses only changes in the operational strategies of the reservoirs, the initial impacts of reservoir construction are considered only to the extent as an assumption that cultural resource values are sustaining ongoing, adverse impacts from inundation and current operational actions. It is also assumed that the level of impacts due to reservoir operations change through time.

There are four basic reservoir areas that are important to understanding effects to cultural resources: 1) The Inundation Zone – the main body of water making up a reservoir excluding its lateral edges; 2) Zone of Fluctuation – the reservoir area where water levels range between high water to low water marks and includes land not always under water; 3) Zone of Direct Impact – the reservoir area

where cultural resources are located and potentially in contact with water levels; and 4) Zone of Indirect Impact - the land adjacent to a reservoir that is not exposed to inundation (Figure 3-4).

In order to minimize impacts to cultural resources within a hydropower reservoir environment, the ideal operational strategy would have been one in which the reservoir was filled rapidly and there are no reservoir level fluctuations. The direct impact zone of the reservoir environment where cultural resources are subject to adverse effects would ideally have gently sloping, stable landforms characterized by either protective vegetation cover, or solid rock formations.

Under such an ideal scenario, adverse effects to cultural resources would be confined to the inundation zone. The study area contains some of these ideal impact zone environments, however, it also contains large areas with steep and unstable landforms. In these less-than-ideal areas, natural erosive forces and difficult terrain constitute problems for cultural resource management.

The feasibility study alternatives for the Major Systems Improvement and No Action Pathway Alternatives would essentially have the same effects on cultural resources as no changes in reservoir regulation the direct and fluctuation zones of the reservoir environments are planned. Thus, a clear understanding of current impacts on cultural properties is considered sufficient to understanding expected effects of alternatives for the Major Systems Improvement and Natural River Drawdown pathways. However, it is possible that with expected upward trends in anadromous fish species populations resulting from the Major Systems Improvement Alternatives that there may be a slightly increased use of fishing sites along some system.

Within the permanent reservoir area, the dominant effects on cultural resources are from inundation and the biochemical processes active in that environment. Sedimentation and underwater erosion processes are active, but secondary factors. Previous geomorphic analyses have viewed cultural resources in the permanent reservoir area as being protected, but not necessarily preserved. In terms of the adverse effects on cultural values this portion of the environment sustains, the inaccessibility due to inundation and burial in sediment have had the greatest impact. The two geomorphic processes that have dominated in this environment are slumping and sediment deposition. Drawdown of the reservoirs to a near free-flowing would expose many formerly inundated sites. Impacts of inundation will be replaced by new impacts including such things as surface erosion, vandalism, and recreation impacts.

Within the zone of fluctuation, the predominant impact is erosion from the mechanical effects of wind, ice and water motion; waves, currents and water level changes. The zone of fluctuation is also subject to biochemical and human-caused impact, both of which produce widely varying degrees of adverse effect. This zone is where geomorphic processes are most active and where these processes cause the most impact on cultural resources. The erosional geomorphic processes that predominate in the zone of fluctuation include mass wasting, sheetwash, channeled flow, wave wash, ice gouging, and deflation (wind erosion). Depositional geomorphic processes active in this zone include mass wasting (mostly in the form of bank caving and sloughing), fluvial deposition from tributary streams and, when the pool is elevated, sediment deposition from the reservoir. Airborne deposition is also an important sedimentary process in the fluctuation zones of the projects located on the Columbia Plateau.

The zone of indirect impact lies above the normal high water line. It is variable in extent and is primarily affected by susceptibility of the soils to erosion and mechanical impacts stemming from human use of the land. This zone is often overlooked when considering operational strategies

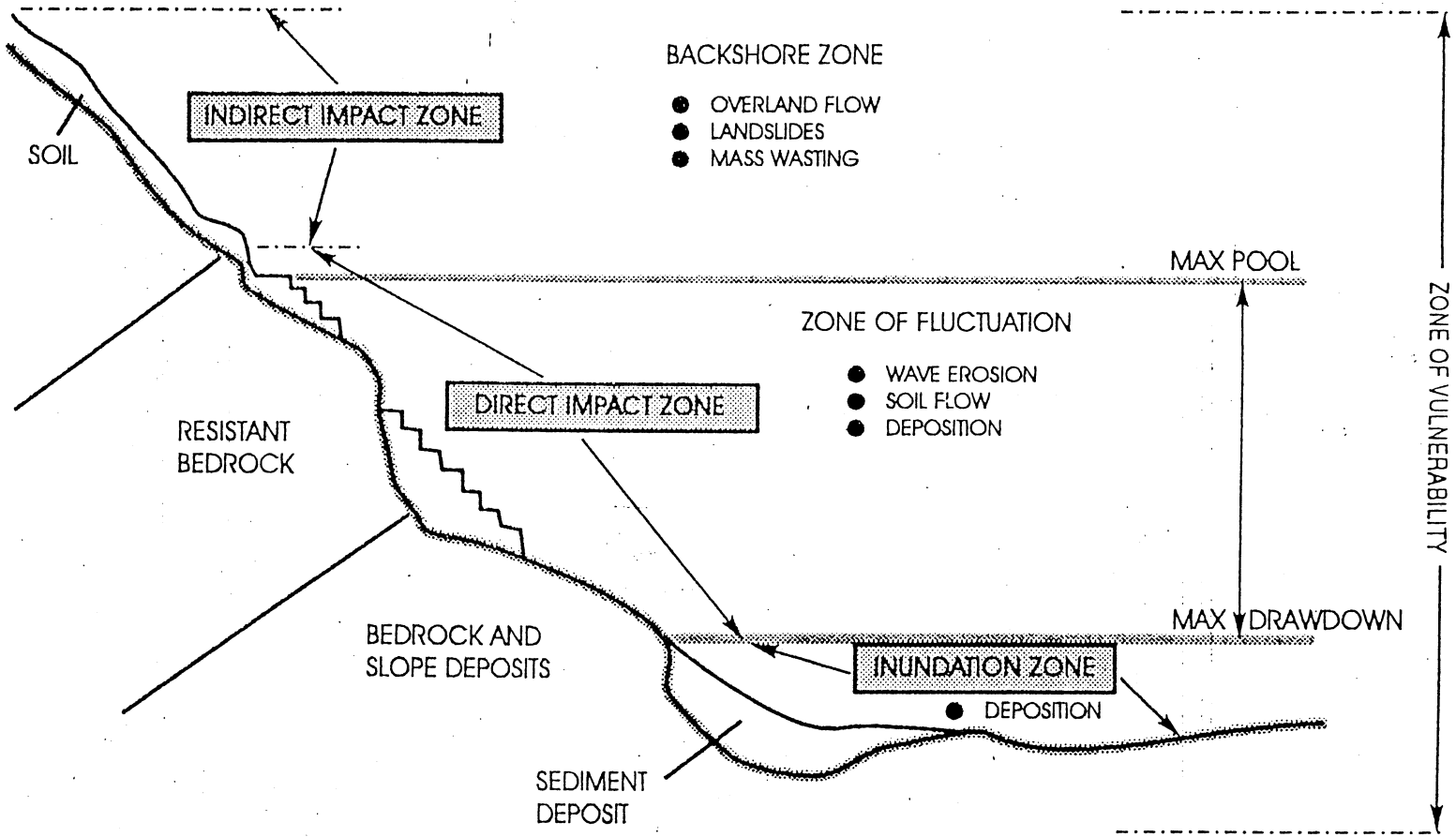

Figure 3-4. Geomorphic Zones found in a Typical Storage Reservoir

Source: SOR FEIS, Appendix D, Figure 3-1

because it is seldom or never in direct contact with the pool. However, reservoir levels directly influence such things as human access to the zone, stability of backshore soils, groundwater fluctuations and biological composition. Sediment issuing from this zone makes a major contribution to the total sediment load entering the reservoir. Erosion is the primary geomorphic process acting in the indirect impact zone. The adverse effects are mostly from mass wasting, sheetwash, channeled flow and direct rainfall impact, although erosion susceptibility factors condition the degree to which these processes affect cultural resources.

The free-flowing pathway alternatives would increase the size of the indirect impact zone significantly. Land currently within the impact zone would be added to from the present high water line down to the new "free-flowing edge zone." The reservoir fluctuation zone would be removed and the new impact zone established. A host of short and long term effects known from studies of free-flowing behaviors, i.e. cultural resources susceptible to flood events, river bank erosion, and river bed course changes would expose archeological sites to potentially adverse conditions. However, the primary impacts to cultural resources would likely be focused along the free-flowing edge zone where erosive forces are expected to be less than those now experienced along the reservoir's zone of fluctuation.

3.7 Susceptibility to Erosion

A soil's susceptibility to erosion depends on several factors. These include precipitation effects, soil types, slope, topography, vegetative cover, and erosion control practices (Buckman, 1969). Of course, each of these factors varies throughout each of the Lower Snake River Project reservoirs' and the impact zones for cultural resources such that, for this study, only the large-scale aspect of erosion susceptibility is considered. Soil scientists have determined characteristic responses to erosion processes and customarily report these responses as part of all soil surveys that are conducted. In terms of large-scale considerations, the single most important erodibility factor to address is the soil texture. Soil properties such as texture can be used to determine whether a soil type is susceptible to transport by forces like wind, water, or temperature extremes.

Soil types and landforms differ in their susceptibility to erosion at the various hydropower facility reservoirs. Generally speaking, soils of the Columbia Basalt Plain region, on which the lower Snake River hydropower facilities are located, are derived from glacier and flood deposits. They are light soils, highly susceptible to erosion by water and wind. The lower Snake River projects have steep slopes that are somewhat susceptible to slumping and land slides.

Shoreline equilibrium is another important concept applicable to the geomorphic analysis. Under consistent operating conditions, and where soils are less susceptible to erosion, reservoir shorelines can reach a state under which further erosion and sedimentation are stable or nearly stable. By the time this happens, cultural resources in the stable shore zone will have been largely destroyed. If the reservoir stays at or returns to this level, however, the erosion of nearby areas can slow. If reservoir operations establish a new stable stand, the shoreline equilibrium can be upset, and major new impacts can occur.

It is unknown what level of impact has occurred at most of the inundated sites. The establishment of a new free-flowing river level would result in some new impacts, which could include movement of sediments deposited during the reservoir period. Shoreline equilibrium after return to free-flowing river levels could take some time.

Several factors account for the shoreline equilibrium state. Waves will cut benches through softer soils to bedrock, for example, after which erosion of the bedrock occurs at a much slower pace than before. As waves dissolve finer and looser soil elements, heavier and less transportable rock pieces accumulate on the shoreline. These eventually armor the underlying softer soil from wave action, slowing erosion considerably.

Shorelines can also reach a point of equilibrium due to the completion of slope failure cycles. Due to the repeated action of on-shore waves, a stable reservoir shoreline will begin to cut a bench or notch in a hill slope. Depending on the strength of the shoreline soil material, wave erosion may cut a vertical bank. In clayey or gravelly soils, this bank may reach tens of meters in height. At some point, continued erosion at the slope's toe or loss of stability due to groundwater pressures may cause this cut-bank to fail. This may also occur due to drawdowns, such as the kind conducted in 1992 for the lower Snake River system dams, when water held within the soil mass weighs down the soil in the bank, causing it to slump into the reservoir. These failures produce spectacular slides, mudflows, and slumps along reservoir shorelines. Groundwater flow can also cause these slope failures. Cultural resources located on slumping landforms are often destroyed.

A similar erosion mechanism found along the reservoir shorelines is the landslide. This can occur especially in areas with steeply sloping bedrock and shallow soils. In such places, groundwater flow between soil and rock can exert enough pressure to lift the soil away from the rock surface. This can occur where waves have cut a notch or bench at the bottom of the slope, removing the slope's supporting base. Landslides are often set off by rainfall or snow melt which saturates soil slopes, raising their water pressure. Hill slopes in a reservoir drawdown zone are particularly susceptible to land slides because they are devoid of vegetation that would otherwise help to hold the soil mass together.

A wave-cut bank may never develop in silts, sands, or other low-strength soils because the soil materials do not possess sufficient strength to support vertical banks. In these cases, wide, gently sloping beaches form. Such soils are particularly susceptible to internal erosion processes, such as piping, that are especially aggravated by rapid reservoir fluctuations. Irregular ground, potholes, linear ridges, and depressions along the reservoir shorelines are characteristic of such soils. Fluctuations and rapid reservoir drawdowns can cause the buildup of high fluid pressures within the soil pores. When the reservoir level drops, the soil releases this water rapidly, resulting in small-scale slumping, piping, and wasting.

Sheet erosion is another problem that can become serious under some conditions. In non-vegetated reservoir draw down zones, runoff from rainfall can concentrate in rills and gullies on long or steep slopes. Run-of-river reservoirs generally do not develop this type of erosion, since they never have substantial areas of exposed reservoir slopes, and exposed slope lengths are short. The free-flowing alternative would result in large temporarily non-vegetated zones.

A small percentage of reservoir erosion is directly anthropogenic (human-caused). Boat wakes and dredging cause minor and generally localized erosion. In some locales, road cuts and side-cast fills have become erosion sites when shorelines impinge upon them, although these are generally stabilized and repaired.

3.8 Impacts of Depositional Process

In the permanently inundated reservoir zones, deposition processes predominate in mechanical impacts to cultural sites. Reservoir sedimentation rates vary depending on the geology and climate of the reservoir watershed. Nevertheless, in all reservoirs, sedimentation is an inexorable process.

In general, post-impoundment sedimentation tends to enhance cultural resource preservation by providing a sediment buffer against mechanical impacts. However, cultural resources buried under a deep silt and water column are no longer accessible for research, or vandalism. Little is known about the long-term impacts of deep sediment burial on fragile cultural deposits. In addition, two processes in the reservoir offshore may be of concern to cultural resource managers: reservoir silt deposit impacts to deeply buried cultural sites, and changes in basin morphology resulting from sediment saturation, slumping, and creep.

There have been no definitive studies of the impacts of heavy silt deposit on cultural deposits; the effects, for example, of weight load, soil saturation and movement, etc., are not known at this time. However, it is only prudent to assume that these processes may result in some adverse impacts to fragile cultural remains. Underwater landslides and sediment shifts are known to occur in the permanently inundated zones of reservoirs (Ware, 1989).

Exposure of formerly inundated by significant sediment load accumulations will result in different mechanical impacts. These will include renewed erosive impacts, possible accelerated slumping and more frequent landslides, and possible biochemical changes in soils. Some benefits, however, may exist from accumulated sediment loads over newly exposed cultural sites. If accumulated sediment can be kept in place using counter-erosion techniques, such sediment loads will tend to protect the integrity of a cultural deposit. Establishment of a permanent native vegetation cover on sites, re-contouring adjacent site soils, and/or applying a layer of rock materials over unstable site areas may be effective means for limiting soil movement, or loss to a site's integrity.

3.9 Reservoir Operations and Impacts to Cultural Resources

3.9.1 Impacts to National Register Sites and Districts

All of the sites and districts in the study area currently listed on the National Register of Historic Places are affected in some way by reservoir operation. Many of these sites and districts have portions located within reservoir pool drawdown zones or below current minimum water levels. Others are located in or near shoreline recreation areas and are subject to vandalism and theft.

Many other cultural resources at the projects are potentially eligible for National Register nomination, but have not been thoroughly evaluated or nominated. These sites are to be protected just as if they had been determined eligible. Nonetheless many lower Snake River sites experience ongoing loss of integrity, an important element of NHPA significance, due to the effects of reservoir level fluctuations, recreational activities, and natural weathering processes.

3.9.2 Impacts on Cultural Resources in the Current River Fluctuation Zone Under the Existing Operation and Major System Improvements Alternatives

Shoreline erosion within the current drawdown zone is a very serious impact to cultural resources on the lower Snake River. Within the shoreline fluctuation zone of most man-made reservoirs, virtually all categories of impacts to cultural resources are magnified, with mechanical hydrological impacts

constituting the greatest threat to cultural resources. Wave action poses the most serious threat in the reservoir fluctuation zone. Important variables include wave approach, wave intensity, and shoreline geomorphology. The interaction of these variables will determine the formation and configuration of the shoreline and the high-energy beach zone.

Fluctuating pool levels enlarge the zone of destructive wave action by increasing the effective beach zone of a reservoir. As the reservoir pool level draws down, breaking waves strike the saturated and unconsolidated elements of the reservoir basin which have already been deprived of a protective vegetative cover. These fragile sediments are susceptible not only to wave erosion but also to subsequent wind and water runoff erosion within the exposed drawdown zone (Lenihan et al., 1981).

Whereas very little is known about impacts to cultural resources within the permanently inundated reservoir zones, a great deal of comparative data is available on shoreline impacts, in part because sites that are periodically exposed are more accessible to scrutiny. Archaeological surveys of drawdown zones indicate that waves and near shore currents can dislodge and displace large artifacts. Extensive impacts to architectural features and archaeological midden deposits have also been reported. At Wister Reservoir in Oklahoma, several prehistoric midden sites were virtually leveled by shoreline wave erosion (Galm, 1978). Similar effects have been observed at reservoirs throughout North America (Lenihan et al., 1981). Although only about 25 percent of the lower Snake River reservoirs resembles reservoir geomorphology conditions found at Wister Reservoir, the study area may be more predisposed to such cultural resources impacts given its typically steeper terrain.

Although mechanical impacts predominate in the reservoir fluctuation zone, the potential for biochemical and human impacts on the shorelines of reservoirs is greater than in any other reservoir zone. Biochemical activity is accelerated in the shallow waters of the reservoir littoral zone because of higher light, dissolved oxygen levels, and ambient temperatures. These conditions will support more organisms that may degrade perishable cultural materials. Similarly, the potential for human and animal impacts is greater in the shoreline fluctuation zone than in any other reservoir zone. Reservoir environment recreation and all its attendant impacts are concentrated at the reservoir shoreline: boat ramps, swimming beaches, campgrounds, recreational vehicles, power boats, and their destructive wakes are all potential sources of adverse impacts to fragile cultural resources.

As human use and visitation of the lake shore increases, vandalism invariably increases. Since native vegetation is often deflated along the periodically inundated shoreline, cultural resources are often highly visible and more susceptible to human impact.

Sites not subject to reservoir conditions may still be subjected to a wide range of adverse effects, depending on local circumstances and human activities. In some places, surface erosion due to wind and runoff is very serious; in others, it is not. Similarly, some sites are very accessible to the public and experience vandalism when exposed, and others are less accessible or more difficult to detect. By contrast, shoreline erosion constantly eats away at sites where it occurs.

3.9.3 Impacts on the Reservoir Backshore Under All Proposed Alternatives

The reservoir backshore is the area above the level of the maximum reservoir pool, in the case of an operating reservoir, or above maximum high water, in the case of a naturally flowing river. It extends upstream and upslope to include much of the reservoir watershed. There are no direct

mechanical or biochemical impacts in the reservoir backshore caused by reservoir operation. But, other impacts can be anticipated that are directly related to reservoir construction and use. Reservoir construction and use results in increased access to a complete watershed, making previously inaccessible areas readily accessible to anyone with a boat and an inclination to explore. A marked increase in cultural resource vandalism accompanies the construction of a new reservoir, and destructive changes in watershed land use may further degrade cultural resources.

In addition to outright vandalism, changes in land use following reservoir impoundment can have adverse impacts on cultural resources. The reservoir backshore attracts picnic areas, campgrounds, hiking and riding trails, new roads, boat ramps, and parking lots. Many of these developments would follow the return of a reservoir to free-flowing level as well, in the newly exposed backshore areas.

The impacts of domestic livestock pose additional threats to fragile cultural resources. Increases in livestock grazing following freshwater impoundment may have a serious impact on backshore resources: cattle trampling breaks up artifacts on the ground surface: cattle also topple standing walls, wallow in the soft soil of trash middens, and destroy the fragile stratigraphy of rockshelters. Changes in livestock use of newly exposed backshore areas following a return to free-flowing river levels should exclude livestock impacts. The existing corridors through which livestock have been allowed to reach the reservoirs over Corps property for watering would be removed, and mitigation explored concerning alternate water sources on livestock owners' land.

3.9.4 Impacts on Cultural Resources Between Current Reservoir Operating Levels and Free-Flowing Levels Which Would be Exposed by the Natural River Drawdown Alternatives

The proposed Free-Flowing River Drawdown Alternative would cause a higher rate of site exposure than the other alternatives. The current set of cultural resource management issues for the project would in large part be exchanged for another set. Significant impacts to sites may result under the current proposed 2-foot-per-day drawdown rate of reservoirs across a broad range of soil types and landforms (Center for Northwest Anthropology, 1992). This rate would be too rapid for many sites in the direct impact and inundation zones of reservoirs without causing losses to the integrity of sites' potentially significant cultural deposits. Potential effects on newly exposed sites in this reservoir system would include vandalism, theft, surface erosion, slumping along river banks and hill slopes, lateral displacement, trampling/wallowing by hoofed animals, rodent burrowing, climatic/precipitation cycles, and biochemical soil changes.

Water flow events such as caused by spring upland releases, or flow augmentation for anadromous fish runs are expected to have no greater effects than current reservoir fluctuation impacts. Effects would be re-focused to the meandering zone of the free-flowing course, typically along the river edge. In the drawdown alternative, short and long-term river behaviors will re-expose sites to periodic flood events, and river movements that alter terrace structures and river bed channel locations. Such river movements would occur within the limits of the lower Snake River's natural meander zones, which generally are expected to be at lower elevations than the current reservoirs' fluctuation zone. Some sites and portions of sites would be re-exposed with an overlying sediment load of variable thickness due to 20 to 40 years of reservoir inundation conditions. Consequently, sites in these circumstances would remain partially or prohibitively inaccessible. While difficult to fully anticipate, new uses of the free-flowing system from recreational, cultural, and agency

administration would largely occur under existing Federal law and policy directives. If the lower Snake River became a significant destination site for recreation, resource protection and public education would necessarily be emphasized.

Many of this alternative's most significant impacts to sites would be temporary. Although most known archaeological sites would be exposed in a non-vegetated zone following the reservoir drawdowns, in time, the reservoir landscape would be re-vegetated and other site protective measures established. Benefits to most reservoir resources would include their renewed access for scientific research, direct cultural resource management (e.g., site evaluations, NRHP nominations, site protection data, recovery), and traditional cultural practices. Site protection by more aggressive measures would be needed at selected sites. Protective structures can be constructed at sites having special circumstances.

If we can assume the culmination of affects for inundated cultural resources and shoreline erosion to sites is often worse than site exposure, we may also assume that alternatives that increase site exposure might be best for the resource. Drawdown would remove the previously constant effects of shoreline erosion at these reservoirs in exchange for free-flowing behaviors within its meander/flood zones. The net effect on cultural and historic properties may indeed be positive. However, a cultural resource management plan with aggressive resource treatments and preservation strategies, and attendant greater costs, would need to be implemented. Congressional appropriations might have to be re-examined to reflect a change in agency use of the lower Snake River to cover greater costs in resource management needs.

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4. Development of a Cultural Resources Management Program

4.1 Program Coordination with Consulting Parties

Development of a comprehensive resource management strategy requires that the Corps gather as much information as is possible about the nature and condition of the cultural and historic properties located on its lands. To that goal, the Corps is participating in the Payos Kuus T'suukwe' working group of the Federal Columbia River Power System Cooperative Group. This group was formed by the Corps' Northwest Division in order to address cultural resources issues collaboratively with affected tribes and to help in meeting Federal responsibilities for cultural resources protection and management.

Information gathered through cultural resources projects determined by the Corps, with the assistance of the Cooperative Group, will enable the Corps to develop appropriate management plans. Final determination of the preferred alternative of the feasibility study will indicate the nature and extent of information-gathering projects needed, and the scope of the final cultural resources management plans.

4.2 Cultural Resource Management Strategy

Federal responsibilities to consider cultural resources include required resources inventories of Federal lands, determinations of sites' eligibility status for the NRHP; formal inclusion to the NRHP, and address of adverse effects under proposed agency activities or impacts resulting from neglect. Management strategies to preserve resources and mitigate natural and human effects to potentially/eligible resources include a wide range of efforts. These include educating the public to the importance of cultural resources; inclusion of cultural resources needs into Federal law enforcement programs; resource inventories and monitoring, site condition assessments, restoration and data recovery of potentially/eligible sites.

Under the three different feasibility study alternative pathways, cultural resources management would continue largely as it exists except under the third pathway. In the free-flowing river drawdown alternatives, cultural resources management responses would address newly exposed lands and resources as a special circumstance with many unknowns as to site locations, conditions and preservation needs. An assertive educational strategy intended to inform the public of cultural resources values and vulnerabilities, and one which interprets the Snake River's cultural history would help protect exposed resources until they can be fully protected by physical or vegetation cover remedies. An aggressive law enforcement policy would be necessary to check site vandalism and thefts. It is anticipated that current levels of site vandalism and theft would increase and an aggressive law enforcement response would best curb any such negative trends. A comprehensive resources inventory to identify and assess resource conditions would be necessary to manage the lower Snake River. Where NHRP eligible/nominated resources are imperiled, cultural resources data recovery and mitigation strategies would be readily implemented. Also, a protection plan involving a variety of physical remedies would be employed to preserve sites from a host of potential adverse effects resulting from a free-flowing drawdown.

4.3 The Cultural Resources Protection Plan

The Federal responsibility to protect and preserve cultural properties under the implementation of the proposed alternative management actions can be met by developing and carrying out an effective management plan. The cultural, historic, and scientific importance of cultural sites can be preserved by various physical means. The engineering aspects of the physical Cultural Resources Plan are discussed in Annex O of Appendix D—Natural River Drawdown Engineering.

Following are measures other than site armoring which can preserve the significance of cultural properties. It must be understood that all site management and protection measures are not appropriate for all cultural sites. The cultural and scientific significance of individual sites must be considered in order to apply effective management and protection measures.

4.3.1 Cultural Resources Monitoring

To beneficially manage cultural resources, the responsible agency must gather information about the condition of cultural properties and the change in condition, due to various impacts, over time. Site monitoring is the critical mechanism that provides that information.

To effectively monitor impacts to cultural resources, the monitoring effort must follow a thoughtfully designed monitoring plan. Development and implementation of such plans would be considerable undertakings. The Federal agency is responsible for the development of such plans and will do so in cooperation with regional Indian tribes and various interested parties.

Site monitoring is a key means by which the Corps can manage cultural resources. Proper monitoring describes site conditions and documents impacts or changes to cultural resources sites over time which can assist in the development of appropriate protection measures. Site observation and protection are directed specifically to areas of erosion impact, such as stream banks and areas prone to vandalism. Such information would be useful in evaluations of sites for their eligibility to the NRHP, resource planning, and archaeological investigations. Site evaluations or archaeological investigation is not part of site monitoring.

The Corps would oversee all cultural resources monitoring. Documentation would include written and photographic information and data entry into the Walla Walla District, Corps Cultural Resource database.

4.3.2 Mitigation or Treatment of Affected Cultural Resources

The usual subjects of CRM mitigation or treatment are National Register eligible sites threatened by adverse impacts such as construction, inundation, erosion, or vandalism. The majority of inventoried cultural sites in the Federal reservoirs of the lower Snake River have not been evaluated (through Determinations of Eligibility for the National Register). Mitigation or treatment planning hinges on this site evaluation process. Actual treatment measures may vary. Some of the common options include the following: site avoidance, protection, data recovery and curation, interpretation and use in educational programs. Simple site avoidance is not possible under the proposed alternative pathways since either continued operational practices requiring the fluctuation of reservoir levels, or permanent reservoir drawdown would affect the integrity of cultural resources. Site protection would be necessary under all the alternatives, however, there would be a tradeoff as to what sites would require protection and the nature of protective measures. For example, many sites subject to the effects of fluctuating reservoir levels often require protective barriers to water

action in order to prevent the loss of significant cultural resource deposits contained in site soils. If reservoir levels were drawn down, many sites might need increased law enforcement protection for the short term.

4.3.3 Avoidance or Protection

Federal agencies should plan projects in such a way as to avoid impacts to cultural resources. Only as a last resort, when destructive effects cannot be avoided will the agency conduct data recovery. In the case of reservoirs, it is often difficult to avoid impacts to resources. Some measure of protection can, however, be secured by bank stabilization programs, protective levees, covering sites, erecting barriers, or other measures.

If the level of significance is high and geologic and soils conditions are favorable, sites may be protected by stabilization efforts such as site capping, slumpage control, and stream bank stabilization. Site protection also includes intensive management efforts such as signage, public education programs, and law enforcement efforts. It is anticipated that, despite general publication efforts to discourage the public from illegal activities such as surface-collecting artifacts and excavating archaeological sites, sites would still be subject to such adverse impacts, especially during the immediate period after drawdown of any project reservoir. This observation is based upon the results of the 1992 drawdown cultural resource monitoring project that documented effects on a select group of known archaeological sites in Lower Granite and Little Goose reservoirs. Thus, a concerted and comprehensive effort to identify illegal activities and prosecute such offenses would have to be in place prior to actual reservoir drawdowns. This would include planning for additional law enforcement, enhanced site monitoring, and an evaluation process.

4.3.4 Data Recovery and Curation

When an evaluated cultural resource is threatened by loss from erosion, vandalism, or other impacts, scientific data recovery may constitute the only way to document the site's significance and offset the loss. All scientific excavation is conducted under site-specific research plans developed in consultation with appropriate parties, e.g. affected tribes, private land owners and State/Federal agencies. A key legal requirement of the data recovery process involves the curation of recovered materials and the associated documentation in a facility meeting strict federal guidelines. This is to insure the preservation in perpetuity of cultural resource collections for their scientific research and educational value. Curation of excavation notes, recovered artifacts, soil samples, and other materials provides research, educational, and interpretation opportunities for the scientific community, local Native American communities, and the public. The retention of current collections in repositories local to the Snake River has proven an asset to professional research interest and contributed to public education.

4.3.5 Native American Graves and Repatriation Act: NAGPRA

Native peoples of the Snake River Basin resided primarily along the shores of the Snake River and its tributaries. Villages were located primarily in the lowlands, even though subsistence resources were acquired from both riverine and nearby upland environments. The focus of people's lives along the river system meant families most often interred their deceased in these same areas. The cemeteries and burial places of native people from the past 12,000 years are not all known to the Walla Walla District of the Corps. Consequently inadvertent discoveries of human remains are not uncommon, yet they must be readily cared for to avoid further disturbance by either human or

natural agents. Both Corps policy and the Native American Graves and Repatriation Act provide direction on how such human remains are treated. Public awareness of how people can help by leaving remains alone and notifying responsible county and federal agencies is still needed. The Corps is required to provide for inadvertent discoveries of human remains, and this will remain a constant need under any of the proposed alternative pathways.

Under NAGPRA, federal agencies and museums receiving federal funds must locate, inventory, and determine the disposition of cultural items such as Native American human remains, funerary objects, sacred objects, and objects of patrimony under their possession or control. The general steps of the repatriation process are outlined in 43 CFR Part 10 and include the determination of affiliation of cultural materials to lineal descendants, federally recognized tribes, or recognition as culturally unidentifiable. A complete administrative record must be developed and acknowledgement made that the federal government does not maintain further responsibilities following the transfer of NAGPRA cultural materials to the appropriate tribe(s). Currently there are four tribes and one band that retain interests in the disposition of both inadvertent discoveries and NAGPRA cultural materials that are in local repositories.

4.3.6 Consultation with Indian Tribes

Cultural resources mitigation or treatment efforts undertaken by the Corps will require consultation with affected Indian tribes. Such consultation must take into account the Corps part in the government-to-government relationship with affected tribes, and Federal trust responsibilities to tribes. (See Appendix Q—Tribal Consultation and Coordination of the Lower Snake River Juvenile Salmon Migration Feasibility Study for further information.) Discussions have to include resource management plans (e.g., mitigation measures) that are sensitive to tribal concerns and responsive to legally mandated scientific data recovery and artifact curation requirements. Affected tribes will participate in direct and meaningful ways. Early and regular contacts with affected tribes in planning and project implementation will provide for collaborative cultural resource management efforts.

4.3.7 Coordination with Mitigation Efforts for Other Resources

Mitigation plans will be developed for impacts on a variety of natural resources. These may include resident fish, wildlife, recreation, and others. In some situations cultural resources appear in the same physical context as these other resources or activities. Where such overlaps occur, planners need to coordinate mitigation efforts so that actions benefiting one resource do not harm another.

5. Summary

The region included in the feasibility study contains rich archaeological, historical, and traditional resources. The proposed management actions, if adopted, would all have effects on cultural resources. Measures would be required to avoid or mitigate those effects.

Those alternatives which include drawdowns are likely to impact cultural resources more intensively than the other alternatives. While some benefits in site preservation might result in re-exposing inundated sites, extensive protection and mitigation activities will be required to preserve the sites' integrity. The alternatives found in the first and second pathways would provide no discernable change of conditions from the current operations of reservoirs for cultural resources. Only the third alternative pathway would provide different circumstances for cultural resources.

In the short term, the effects to cultural resources under the drawdown alternative would predictably provide increased impacts to sites within the reservoir's inundation zone that lie above the historical natural river course and have not been buried by reservoir sediment deposits. Those sites in the direct impact zone of reservoirs would potentially experience the greatest impacts in the short term under the drawdown alternative due to both natural and human agents. Effects to sites in the reservoir's indirect impact zones are not predicted to experience significantly different impacts from any of the proposed alternative pathways. This is thought to be the case since reservoirs do not currently impact these sites other than to redirect land-based human activities to these areas to a greater extent than would be expected under reservoir drawdowns.

Over the long term, effects to sites in both the direct impact and inundation zones of the reservoirs would predictably experience impacts comparable to those currently in the indirect impact zones. This is predicted based upon both the expected benefits from natural processes (e.g., natural revegetation and lack of reservoir actions upon sites) and cultural resource management actions (e.g., public education and site protection treatments). Sites that have been partially or fully buried by reservoir sediments in either the inundation zone or the direct impact zone predictably would not experience further impacts under the drawdown alternative. In fact, such sites may even benefit if they may become more accessible for management as either natural or resource program activities provide opportunities for re-exposure.

Sites not protected by reservoir sediment deposits in the reservoir direct impact zone may require the greatest attention from resource management to prevent short-term impacts. Conversely, they may exhibit the greatest benefits in the long term as these sites become more available for resource management. This expectation is based on the premise that reservoir actions on sites have greater adverse effects to sites' integrity than either natural or managed free-flowing rivers.

Coordination with tribal and state historic preservation offices and the Advisory Council on Historic Preservation Offices would be a necessary part of managing cultural resources under a drawdown alternative. Sites and districts already determined eligible for nomination to the National Register of Historic Places would require particular attention given that the Corps has specified management responsibilities for such resources. Cultural resources mitigation or treatment efforts undertaken by the managing agency will require consultation with affected Indian tribes. Such consultation must take into account the Federal agency government-to-government and tribal trust responsibilities. Discussions need to include mitigation or treatment and management measures that are sensitive to Tribal concerns and responsive to scientific data recovery and curatorial needs and requirements.

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7. Glossary

Aggradation: The deposition of sediment by running water.

Altihermal: A middle Holecene interval marked by significantly warmer and drier climatic conditions than the preceding Anathermal interval. This interval lasted from around 8,000-4,000 years B.P.

Alluvial: Unconsolidated and sorted to semi-sorted material deposited by a stream or other body of running water during relatively recent geologic time.

Anadromous fish: Fish, such as salmon or steelhead trout, that hatch in fresh water, migrate to and mature in the ocean, and return to fresh water as adults to spawn.

Anathermal: An early Holocene climatic interval following the Pleistocene glacial period dating from 14000 to 8000 B.P. Climate was similar to that of today.

Archaeological context: The setting of an artifact or feature in an archaeological site; or, its set of spatial, temporal, and functional relationships to other artifacts and features or the landscape.

Archeological district: A significant concentration of or linkage/continuity between sites, structures, or objects united by common age, spatial proximity and/or archeologically recognizable cultural development, e.g. Palouse Canyon district is a small group of nearby sites of the Cascade time period that exhibit physical evidence of similar tool kits and cultural practices.

Archaeological record: The information that archaeological sites contain about prehistoric and historic lifeways.

Archaeological site: A deposit, construction, or other trace of human behavior, generally greater than 50 years old.

Archaeological survey: A methodical examination of an area in order to detect, map, and record the presence and nature of archaeological sites.

ARPA: Archeological Resources Protection Act of 1979 (16 USC 470aa—470ll).

Atlatl: A spear or dart throwing stick which extends the arm and increases the velocity of the thrown projectile.

Augmentation: Shaping and volume regulation of river flow as affected by hydropower facilities up river from the Lower Snake River Project area in order to support out going anadromous fish runs on their journey to the ocean.

Backflooding: Flood water flowing upstream from a tributary of a stream or from a cataclysmic flood.

Biface: An artifact, especially stone, which is worked on two sides (such as a lance point or a projectile point).

B.P.: Before Present. Indicates the age of material dated using the Carbon-14 dating method. Such dates may be converted to the Christian calendircal references of B.C. and A.D.

Cataclysmic floods: Floods of magnitude greater than that known during historic times. Cataclysmic floods occurred during the glacial epoch when ice dams impounding very large lakes broke, releasing very large volumes of water into the Columbia Basin.

Cordileran Ice Sheet: A large glacial period ice sheet that covered much of the Interior Northwest between the Canadian Cascade and Rocky Mountain ranges. Its southern most extent (Okanogan lobe) was located near the latitude of Waterville, Washington.

Corps: U. S. Army Corps of Engineers

Cultural resources: Archaeological and historical sites, historic architecture and engineering, and traditional cultural properties.

Cultural Significance: The whole set of relationships, understood and defined by a group of people through their culture, concerning their world including landscapes, places, and both living and inanimate things.

Cultural site: A property of archaeological, historic, or cultural significance.

Curation: The cataloging, storage, and preservation of artifacts and other archaeological or historic materials.

Depositional processes: Processes that create and transform archaeological or geological deposits.

Drawdown: To lower the elevation of a reservoir by releasing water at a rate faster than inflow.

Edgeground: A tool worked along one or more edges. Usually an abraded surface formed while using a tool for its intended purpose rather than during its manufacture.

EIS: Environmental Impact Statement

Erosional process: Processes such as landslide and sheetwash, that change landforms by reshaping them, wearing them away, or destroying them.

Exposure (of a natural resource): Making an archaeological, historic, or traditional cultural property vulnerable to erosion or vandalism; for example, by lowering a reservoir water level to uncover an archaeological site.

Geomorphic/geomorhological: Having to do with landforms and the forces that change them.

Historic period/era: The period of time for which written records exist of a place. For example; the lower Snake River after 1805 with the arrival of Lewis and Clark's Corps of Discovery.

Historic property: An archaeological, historic, or traditional cultural property.

Historic resource: A cultural resource or a property belonging to a time and place for which written records are available.

Holocene: The recent epoch of geological time directly following the last glacial period known as the Late Pleistocene. Dates from about 9000 years B.P. to the present.

Housepit: Semi-subterranean house structure with the lower few feet usually set slightly into the ground. Typically, wood beam frame and central post construction with an earthen super-structure. Entry into structure from top side using a log step ladder.

Hypsithermal: A post-pleistocene glacial interval that lasted from 9000-2500 years B.P. Mean average temperatures during this time were above those of modern times.

Interbedded: The state of being stratified among or between other strata.

Lanceolate: Shaped like a lance point. Narrow and gradually tapering toward the tip.

Lithic: Of stone. Usually, in archaeology, defining a stone artifact or tool.

Lithic quarries: Places where people collected or mined stone suitable for toolmaking.

Littoral Zone: The shore area along a body of water, usually a lake, down to the depth of 10 meters.

Loess: A fine unconsolidated wind blown sediment, typically silt.

Lower Snake River Project: Four hydropower facilities (Ice Harbor Dam; Lower Monumental Dam, Little Goose Dam; and Lower Granite Dam), which were planned and built as a set. Includes the stretch of the lower Snake River upstream from the Ice Harbor dam to the upper end of the Lower Granite facility reservoir.

Mano: The grinding or lower surface of a mano and metate. The mortar of a mortar and pestle.

Midden: A refuse heap.

Mitigation: To moderate or compensate for an impact or effect.

NRHP: The National Register of Historic Places, a list of historic properties of local, regional, and national significance.

Paleoindian: Term for the oldest (as determined by scientific evidence) human occupants of the American Continent.

Paleontology: The study of prehistoric forms of life through the study of plant and animal fossils.

Paleosols: Fossil or very ancient sediment deposits.

Petroglyphs/pictographs: (also “rock art”) Carvings or paintings on rocks, especially those made by prehistoric people.

Physiography: Physical geography

Pleistocene: The Pleistocene epoch, characterized by the rise and recession of the continental ice sheets and the appearance of humanity.

Pool: Reservoir, a body of water impounded by a dam.

Radiocarbon assay: The date or age determined by measuring the decay of carbon isotopes in an archaeological sample.

Reconnaissance: An inspection or exploration.

Rock shelters: Natural shelters located under rock overhangs.

Sahaptian: A Native American language family that includes the Nez Perce and Sahaptin languages.

Sahaptin: Native American language with 14 known dialects, which fall under three dialect divisions: Northwest, Northeast and Columbia River. Native Sahaptin speakers who once lived in the LSRP area spoke the dialects classed under the Northeast dialect division.

Salmonids: A family of anadromous and resident fish that includes Chinook and whitefish.

Saturated soil: Soil, the pores of which are at or near their maximum water capacity.

Scablands: The Channeled Scablands of eastern Washington state eroded by cataclysmic flood events.

Slumping: A landslide; the separation of a land or soil mass from a land surface and its movement downslope.

Strata: A layer of rock or sediment of a given age and type.

Stratagraphic: Pertaining to soil strata.

Temporal: Pertaining to time.

Tephra: Greek for ashes. In archaeology; volcanic ashes, usually deposited in a layer among the strata of an archaeological site. A useful indicator of the relative age of cultural deposits.

Terrace: A flat, narrow stretch of ground often having a steep slope facing a river, lake, or sea.

Thermal Maximum: Same as Altithermal, a middle period post-glacial climatic interval.

Traditional cultural properties: A cultural resource having significance for its association with cultural practices or beliefs of a living community that are: a) rooted in the community's history, and b) important in maintaining the cultural identity of the community.

Turbidity: The state or quantity of being turbid; having the sediment stirred up, muddy, cloudy.

Wet and dry cycle exposure: The exposure of archaeological deposits or other items to repeated wetting and drying, causing physical deterioration.

Zone of fluctuation: The area extending between high water level to low water level of a reservoir.